

Spetgang • Wells

The Kids' Solar Energy Book



THE KIDS' SOLAR ENERGY BOOK

even
grown-ups
can
understand

by Tilly Spetgang and Malcolm Wells



Welcome to Mrs. Robinson's solar energy class—the cool place where eco-conscious kids gather to learn about one of the hottest energy sources on Earth: the sun. It's an important subject in our newly aware world, where people everywhere have finally gotten the message: We have to start *right now* if we want to save the planet. Instead of drilling for oil, nations across the globe are looking to the sky, thinking solar, and finding new ways to help each other increase their use of this infinite power source. And since kids—and their parents, too—want to be part of the solution, they'll all enjoy taking part in the fun lesson this book imparts.

Using appealing cartoons with a cast of lively and curious students, experts Tilly Spetgang and Malcolm Wells demonstrate how solar power works in a really clear and understandable way. They detail the history of solar energy, as well as today's newest technology; show how sunlight gets converted to electricity; and explain why it's better than nonrenewable fuels. Plus, they tell you some great things you can do with this clean and natural energy.

There's lots of humor on every page, so the subject is both easy to grasp *and* enjoyable. In fact, *The Kids' Solar Energy Book* is so entertaining and thorough, parents won't be able to resist looking over their kids' shoulders so they can learn too!

Let the sun shine in . . . because in our environmentally challenged world, it's one of the most important things we can do.

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by Tilly Spang and Malcolm Wells

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EVEN
GROWN-UPS CAN
UNDERSTAND



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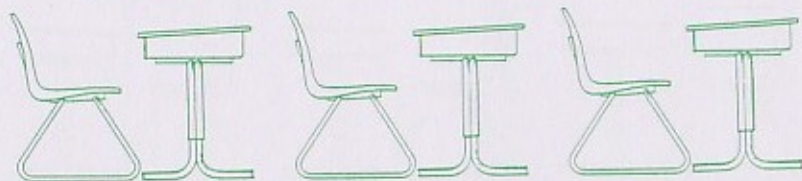
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Foreword

Twenty-seven years ago they were friends: Malcolm Wells (an architect), Irwin Spetgang (an engineer) and his wife, Tilly (a journalist). They shared a *strong* belief in trying to save this beautiful blue-green planet of ours.

Out of that grew this book. Mac is an artist with a wild sense of humor; he let loose, and the other two jumped in with creative chips. They turned to



Tilly for a crystal-clear story of solar . . . and how it works.

But that was in 1982. The world wasn't listening. Few had even heard of global warming and diminishing drinkable water. Now it's on the cover of *Time* and an essential item on our President's agenda.

So here's a brand-new version of *The Kids' Solar Energy Book* even grown-ups can understand. It's aimed at kids (it will be *their* world in a flash) and the people who love them.

Malcolm Wells and "company" had a blast creating this book. Hope you enjoy . . . and laugh, and learn.



Injustice, Hunger, and Your Glorious Future



This world is yours.

That's very generous of you.
Thanks a lot, Mrs. Robinson.



This beautiful blue-green planet of mountains and oceans and skyscrapers and great beasts of the jungles. . . . all yours.

And money, too?
Do you suppose that
includes money?

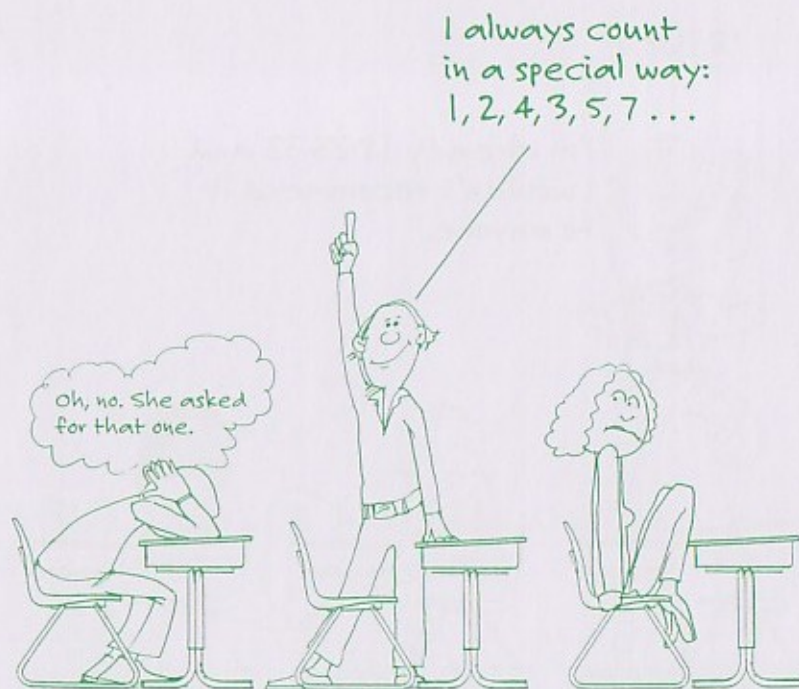
It's probably just
a metaphor.



Have you ever thought about it that way?

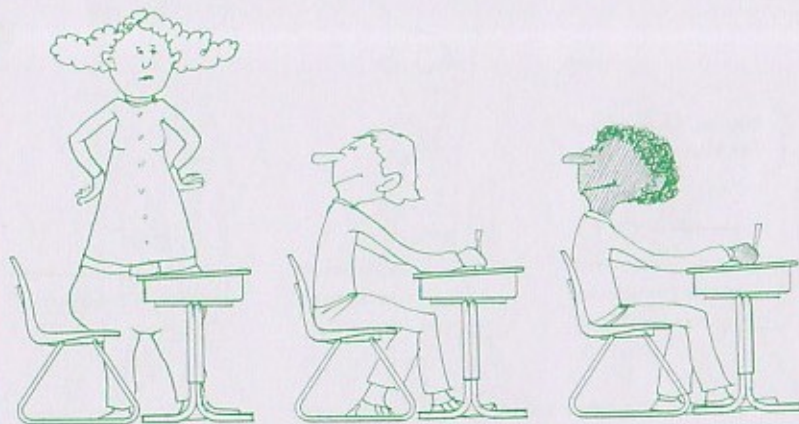


You may be about 12 years old and not feel as if you count in any special way outside your family.



But, in the wink of an eye, you will be 18, 23, 32.

I'm already 18-23-32 and
I wouldn't recommend it
to anyone.



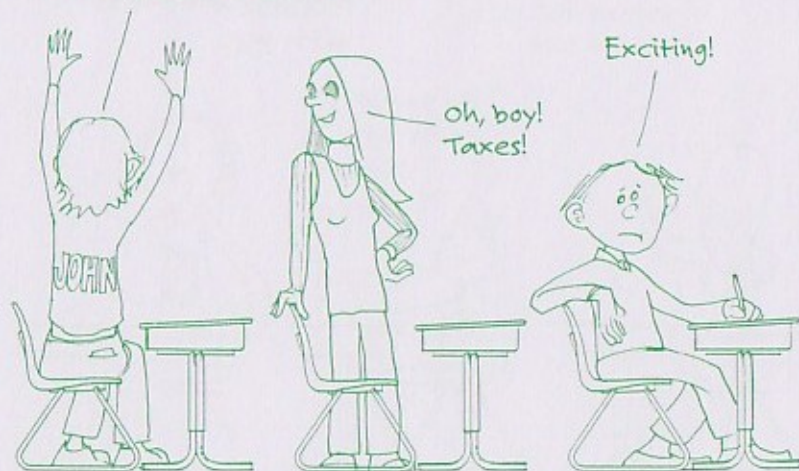
Then you will be in the position of electing the
politicians who make the rules of the land.

Oh, wow.

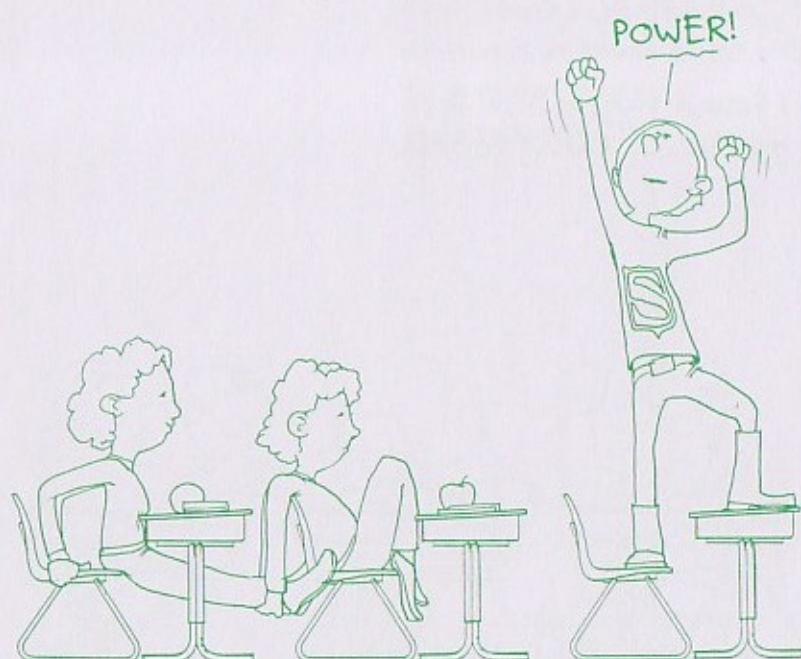


You may own property, pay taxes, and help decide how that tax money should be spent.

If that's what it's like,
I can't wait to get old!



You will have power!



As you grow older, you will begin to realize how many cruel and unjust things go on in life.

I found that out in first grade ... during recess.



You probably will try to change some of these injustices.

Not anymore, I won't. With all my power nobody will mess with me.



It may be that people are hungry and are not being fed. You may fight to stop the killing of giant whales, the clubbing of baby seals.

"Fight to stop the killing!"
That can be our motto.

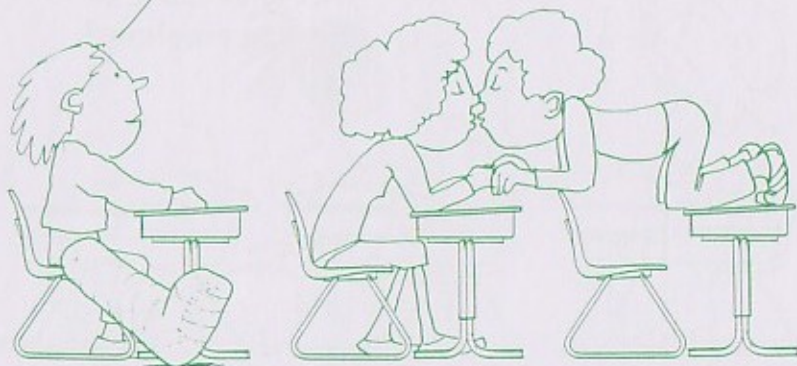
"Kill to kill
the killing!"

"Kill to stop
the fighting!"

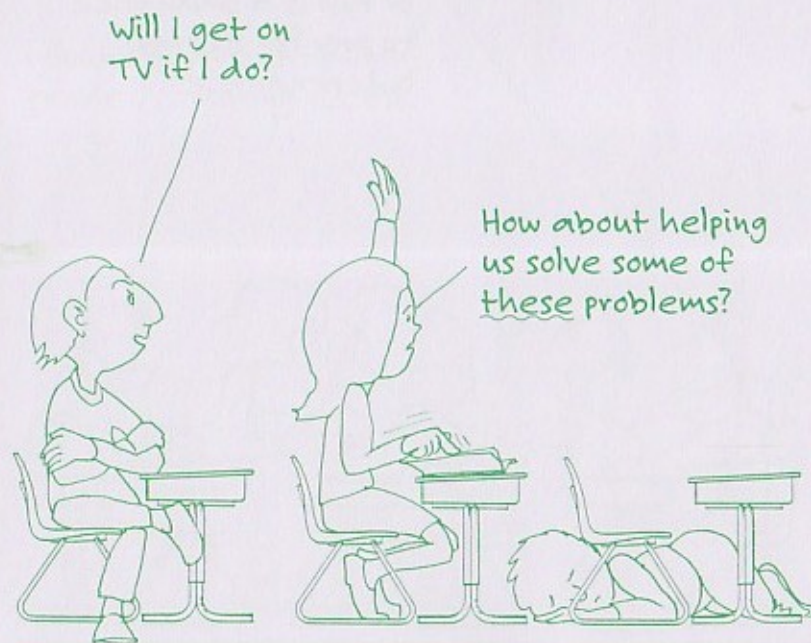


You may come to feel that the spread of nuclear power means deadly destruction.

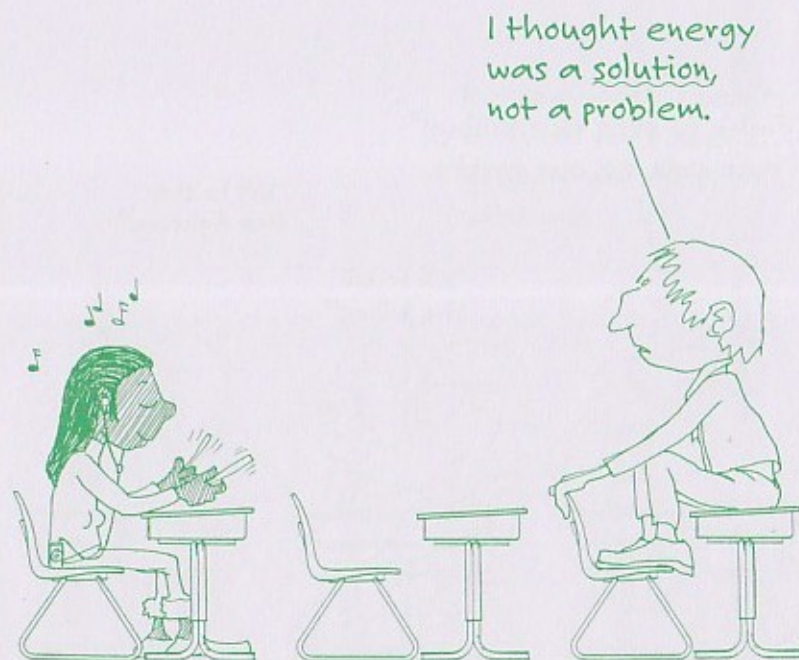
Or, if my paycheck
comes from the power
company, I may come to
feel that a meltdown
or two is a small price
to pay for energy
independence.



As an adult, you will be able to give your time, your creative efforts, and your money to help solve some of the world's problems.



One of the most serious of those problems that you will have to deal with will be . . . energy.



You've heard about the energy crunch.

Yeah. It's a new
candy bar.

I thought it was when
two oil tankers collided.



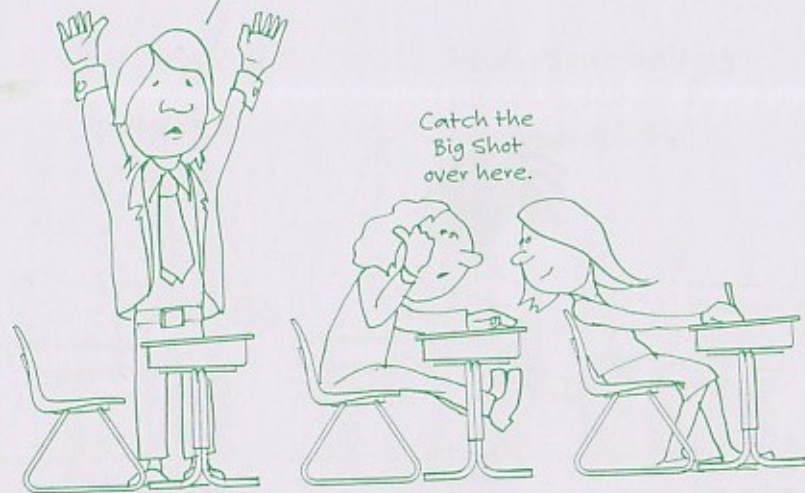
Your mother lowers the temperature in the
house ... to save energy.

Are you kidding?
My mother keeps
it set a 75°, day
and night.



Your father carools with two other people . . . to save energy.

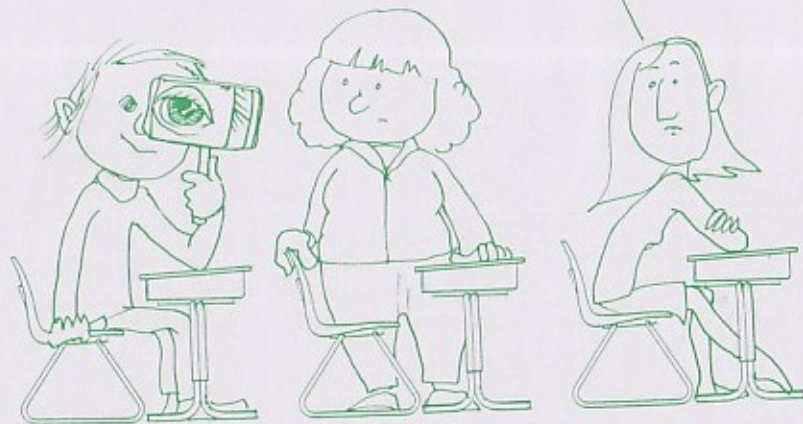
Are you kidding?
He's a very important guy.
He drives to work alone.



Catch the
Big Shot
over here.

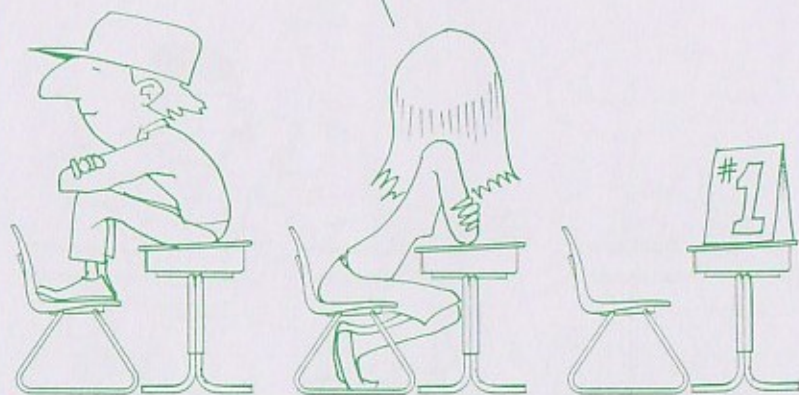
You are asked to turn off lights and the television when you leave the room . . . to save energy.

Yeah, I do it, and
then everybody
else in there gets
mad at me.



Why do we *have* to save energy?

How do we know?
You're the teacher.

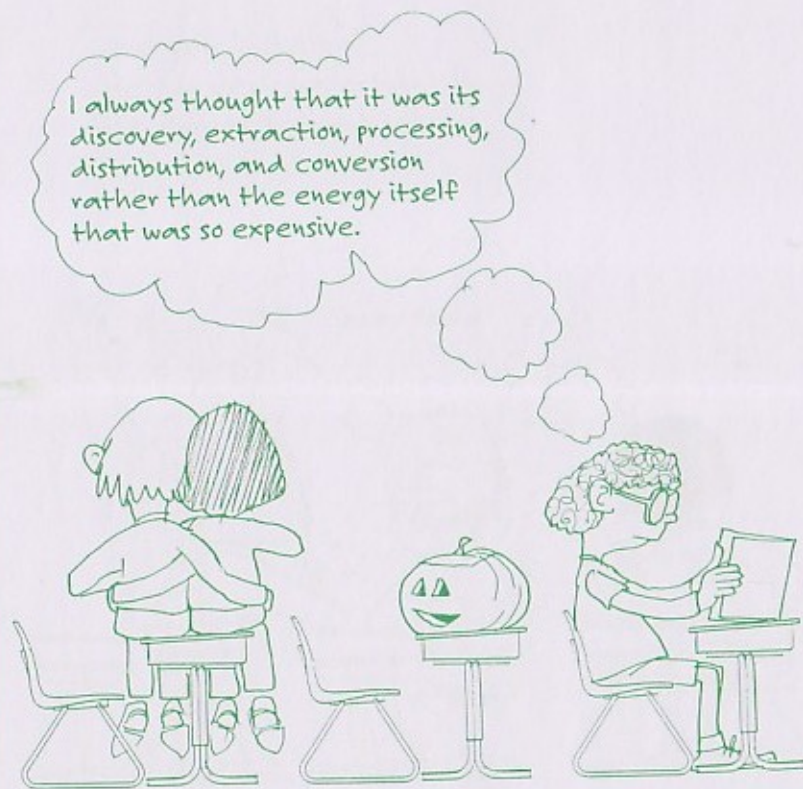


Why can't we simply fill the gas tank in the car, the oil tank in the basement, or flip a switch so we have electricity whenever we want it? What's all the noise about, anyway?



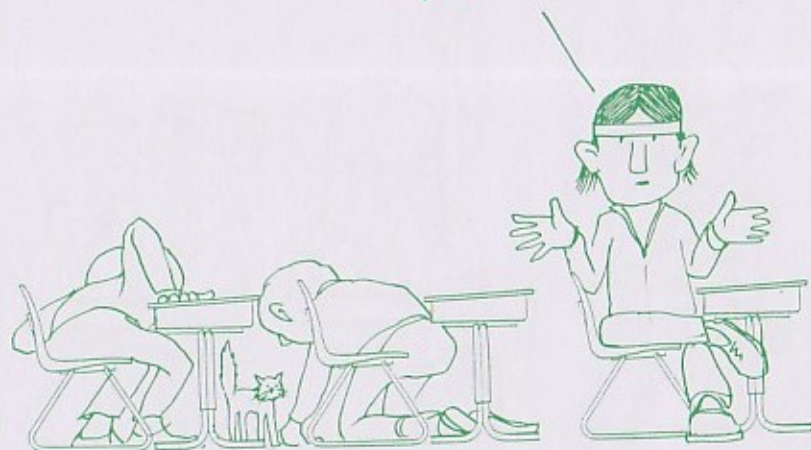
Well, to be truthful, most people want to save energy because it costs so much.

I always thought that it was its discovery, extraction, processing, distribution, and conversion rather than the energy itself that was so expensive.



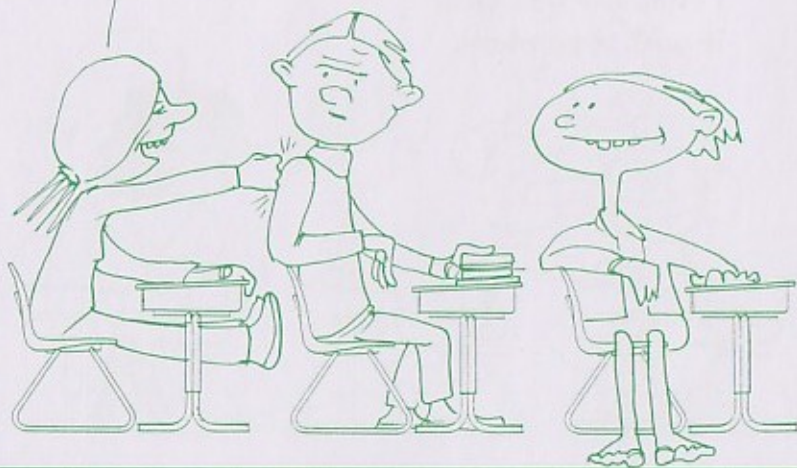
But the major underlying problem is oil.

If oil is such a big problem I say let's get rid of it.



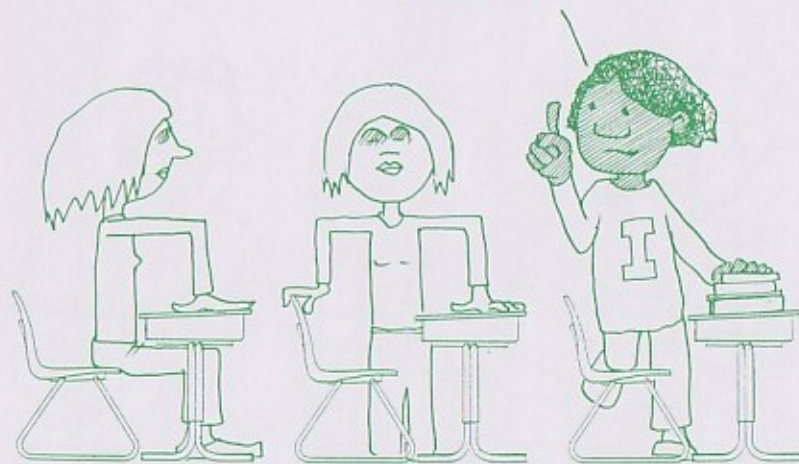
We're running out of it.

Good. That'll get rid
of the oil problem.



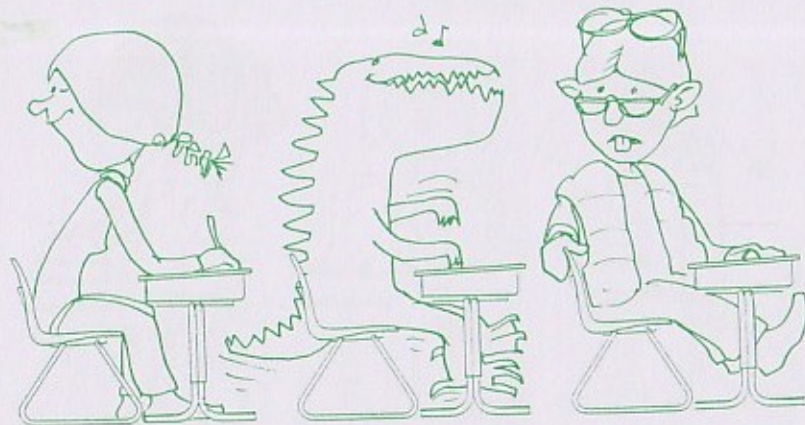
It takes an enormously long time for oil to be
created in the earth, where heat and pressure
help to form it.

Yes. it's much better
to make it in refineries
where it takes only a
few days.



The oil we've pumped out in the past ten years may have taken millions of years to form.

Yecch! I hate stale oil.



You can plainly see that we cannot keep using oil this recklessly or it will be gone in the future, when you, and your children, will need it. Oil is very important.

I thought you said it was a problem.



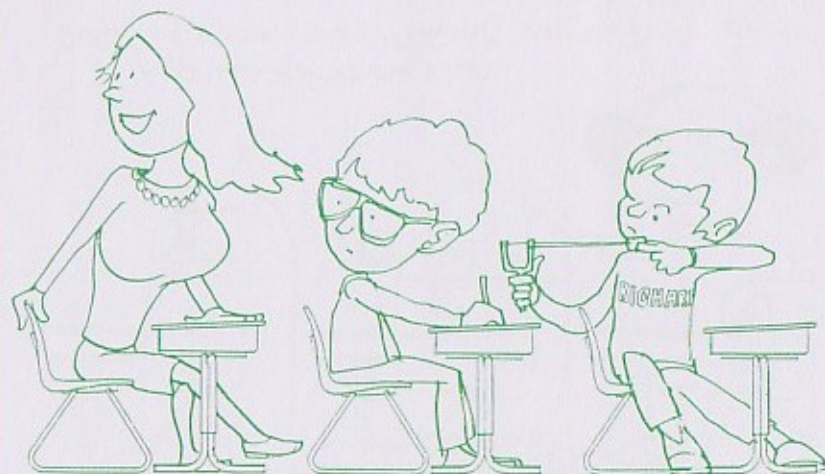
It is used to make plastics and medicine, for instance.

Ugh!
Oily medicine.



It keeps giant machinery running.

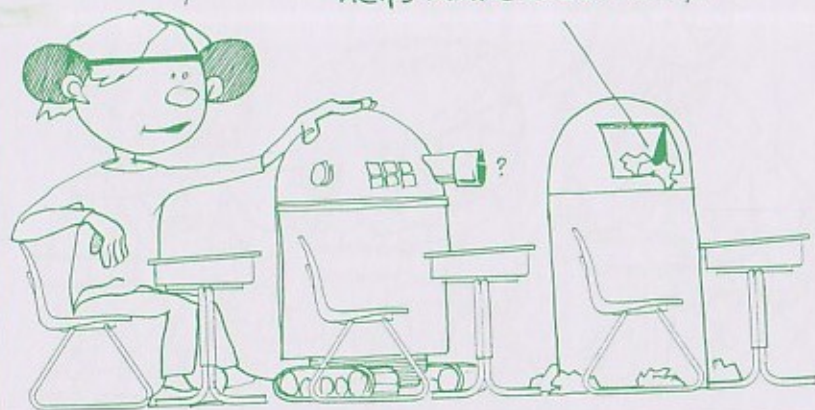
I'll sleep a lot better
knowing that.



In the form of gas it makes cars move, it is important to farming because fertilizer is made from it, and it helps make electricity.

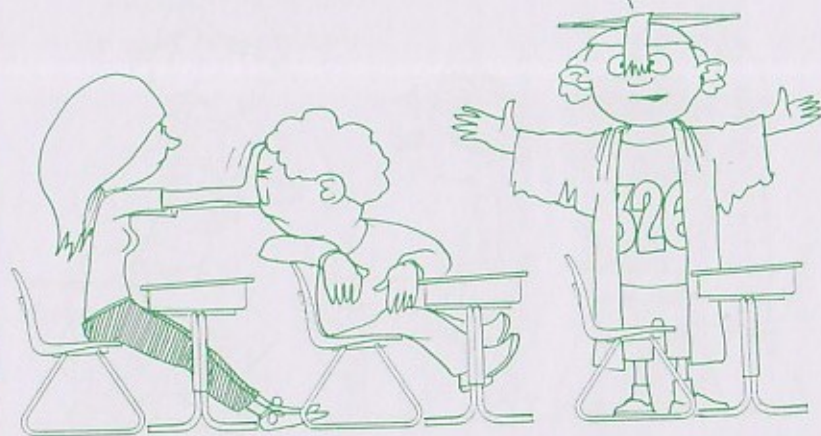
Fertilizer helps make electricity?
Too bad Ben Franklin didn't know that.

Dummy. She means farming
helps make electricity.



All over the world right now, methods are being studied of creating energy without depending on oil.

Obviously, whoever is studying them never studied the first law of thermodynamics: "energy can neither be created nor destroyed".



One of those ways is to use solar energy . . . using the sun for heat.



How It All Began

How what
all began?



If you stopped a caveman and asked him (assuming there was a language you both spoke) where he learned about passive solar heating, he wouldn't know what you were talking about.

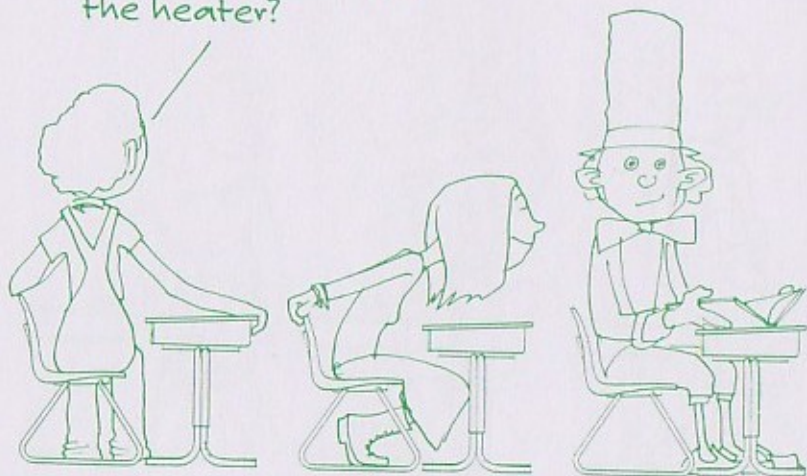


But the caveman used the sun in a smart manner. He moved into caves facing south, from where the sun shines.



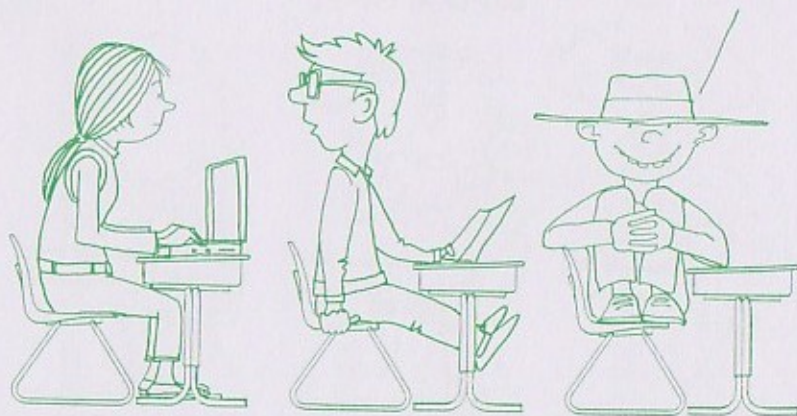
This gave him sunlight, which baked the floor and walls of his stone cave during a good part of the day. Then, at nightfall, when the weather turned cold, those walls and floor gave back much of the same heat, warming the caveman and his family.

Wait a minute, Mrs. Robinson. I thought you said there was plenty of oil in those days. Why didn't he just turn on the heater?



In America's very early days, the Pueblo Indians built their adobe rooms into the south face of cliffs. They used the sun exactly the way cave dwellers did . . . for stored heat in walls and floor.

The Native Americans knew more than we did!



How did they know about it?

Maybe they were
students of yours.

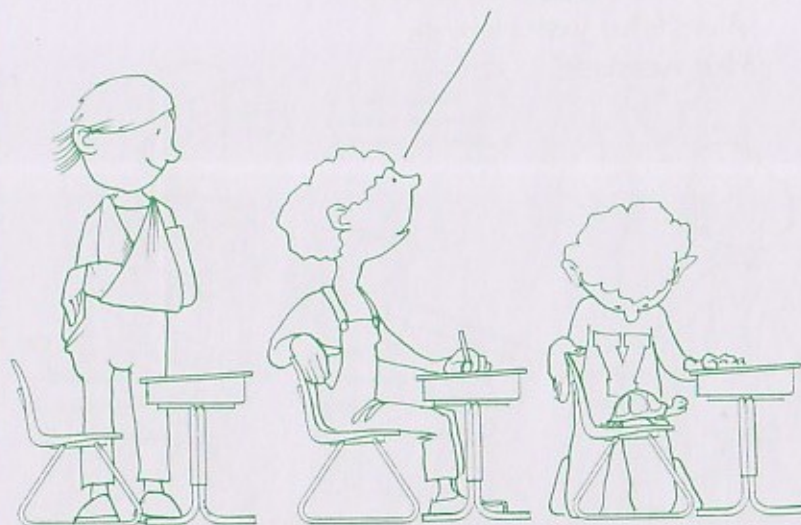
Or maybe it was just
warmer that way.

Maybe they
knew Al Gore.



Simple. They must have felt with their hands
how the stone sucked up heat during the day and
then released it at night.

No. I think history tells
us they always felt
stone with their elbows.



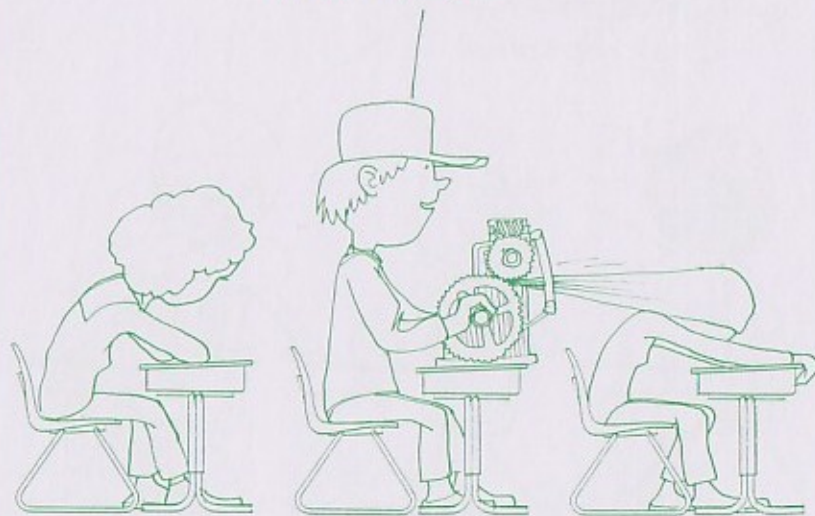
They were smart people, and they applied what they knew to their dwellings.

And that's how wallpaper was invented?

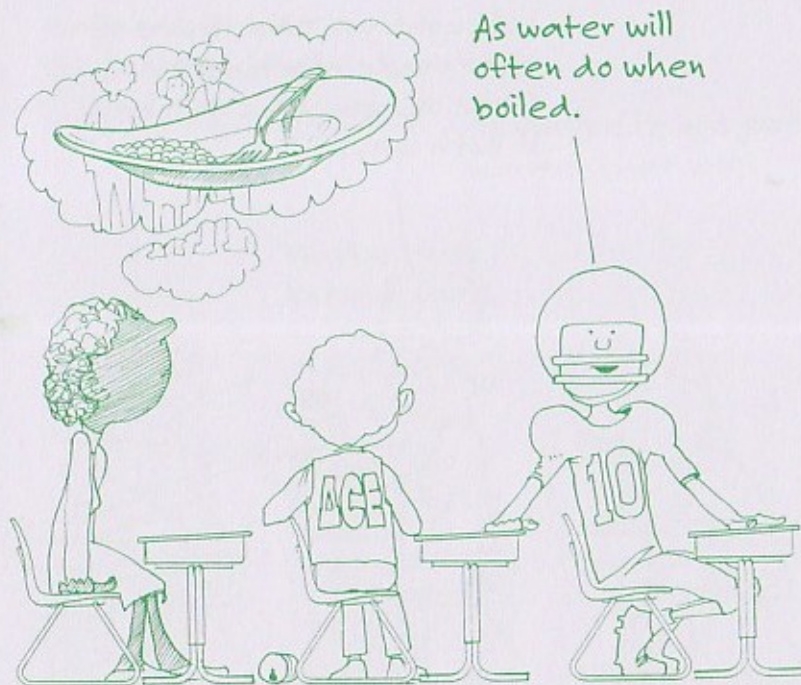


In a major exposition (like a world's fair) in France during the late 1890s, one of the most exciting exhibits showed how a piece of machinery could be run by the sun.

I thought you said it was oil that made machinery run. Come on, now, you can't have it both ways.

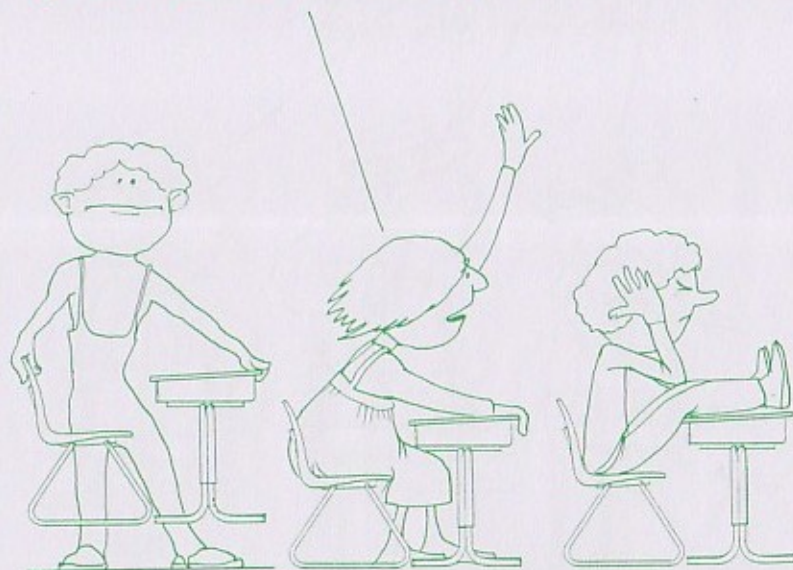


A shiny metal parabola (nothing more than a large, curved dish) focused the sun's rays on a black tank of water. When the water in the tank boiled, it gave off steam.



The steam was sent through a pipe to run a small steam engine, which, in turn, was the driving power for a printing press.

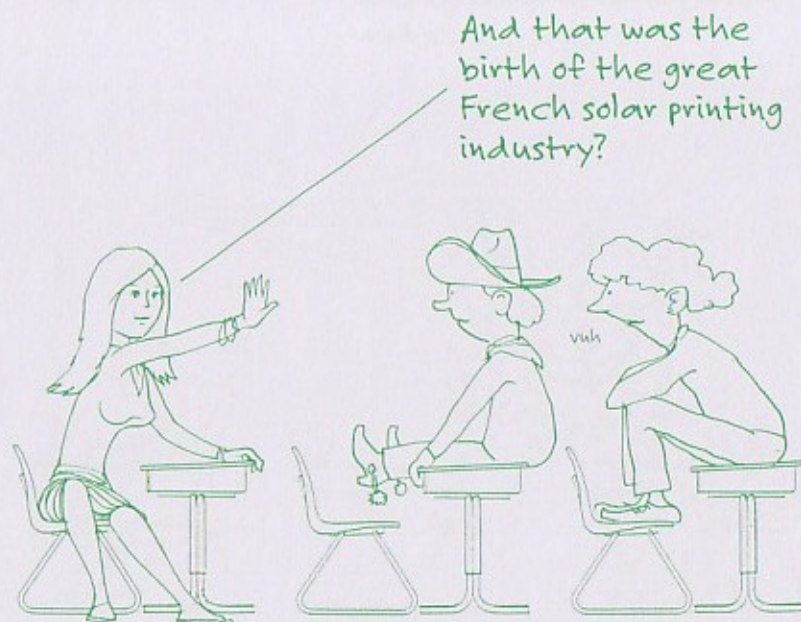
Printing press! What happened to that piece of machinery we were just discussing? OK. Never mind. I get it now. Then what happened?



The press printed leaflets . . .

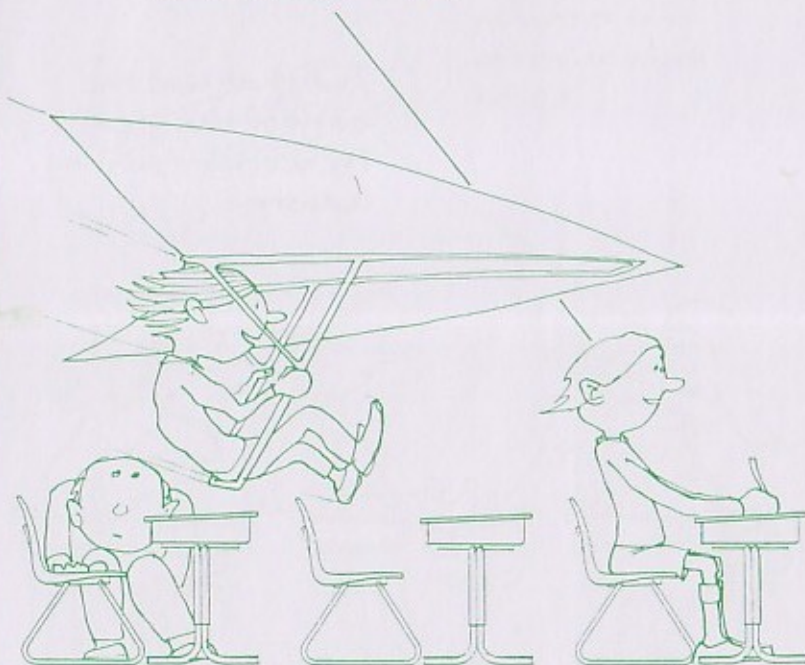


which explained that all the work of printing the leaflet had been done by the sun—without electricity or other power sources.



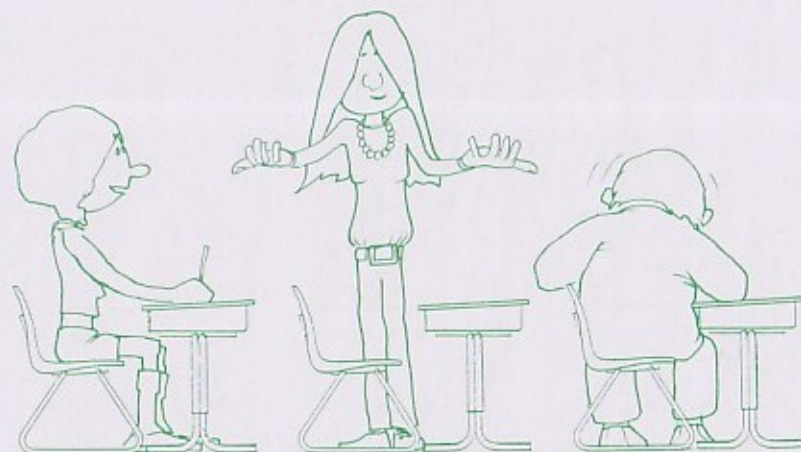
It was, and still is, a great source of wonder.

It's all they talk about
in Paris these days.



Also, in the late 1890s, in the southern parts of the
United States, several types of solar systems were
sold to people in Florida and California.

Those people will
buy anything.



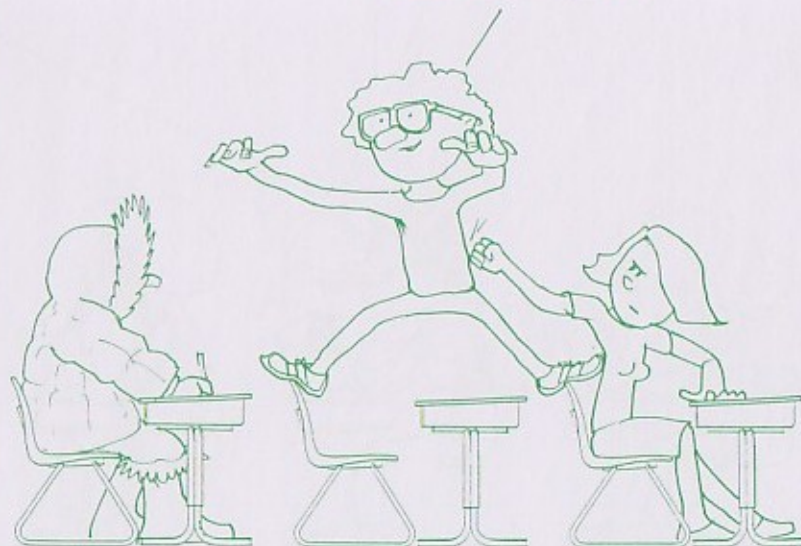
These were roof mounted solar collectors that heated water used for dishwashing, baths, and laundry.

And printing presses, too.
Don't forget them.



Heating water by using the sun's rays was a great deal easier for people living in those hot southern states than chopping wood, building a fire, and keeping a stove going in the heat of the summer.

Wouldn't it have been
easier than chopping wood
almost anywhere?



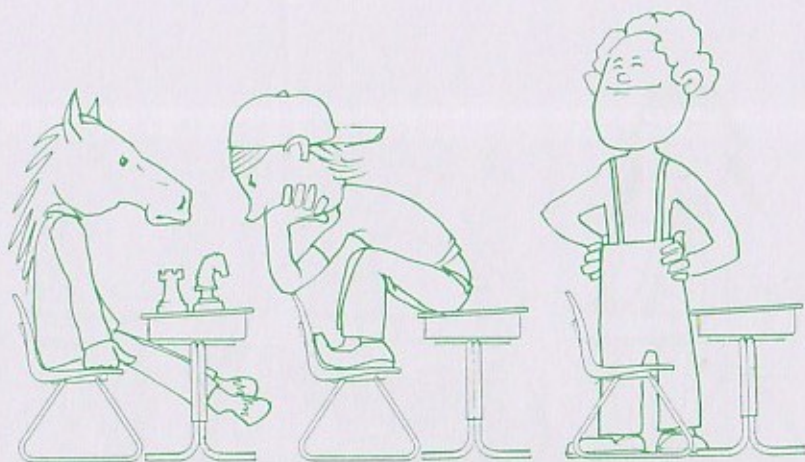
So solar energy was very popular then.

Then the oil problem
arrived, I'll bet.

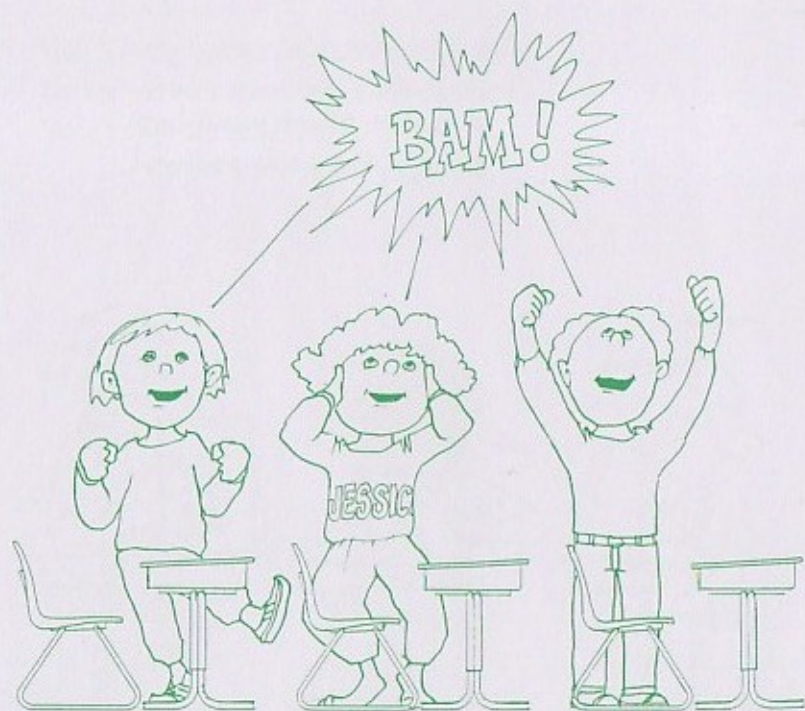


But in the early 1900s, oil and gas were discovered
(the very fuels that are becoming scarce now).

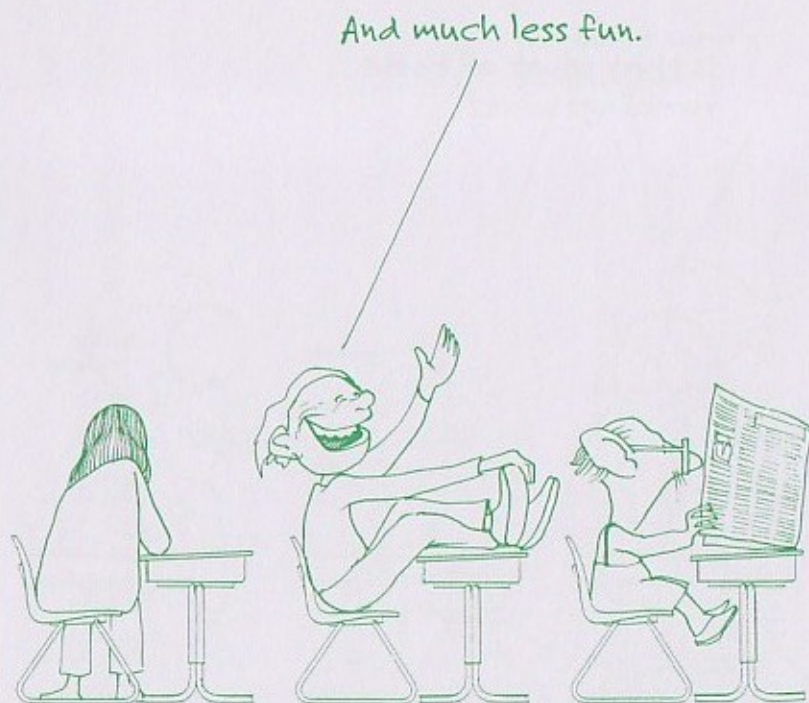
What'd I tell you?



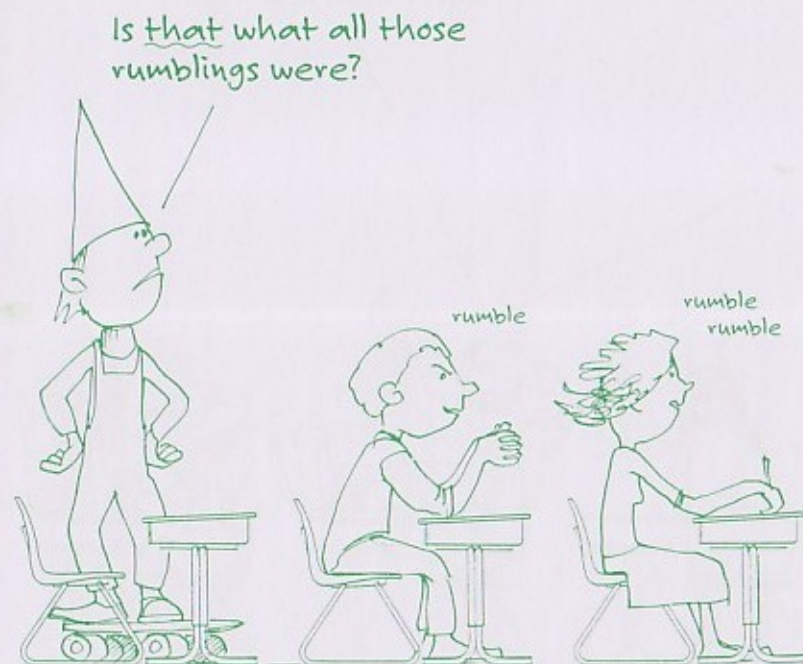
People quickly learned that all they had to do was run gas through a pipe, then light the gas as it came out.



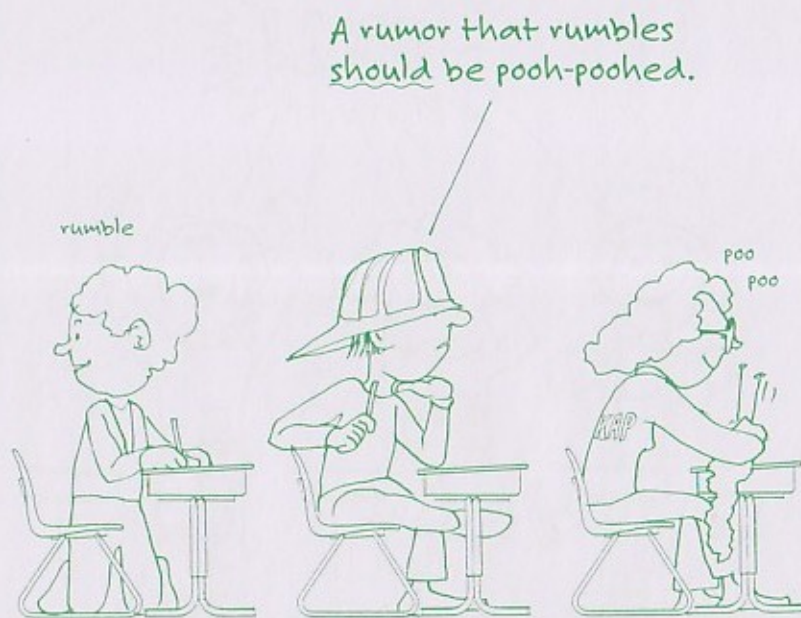
It was cheap. It was easy. Solar energy was put aside as being too bothersome.



But in the late 1950s, rumblings were heard about possible fuel shortages.

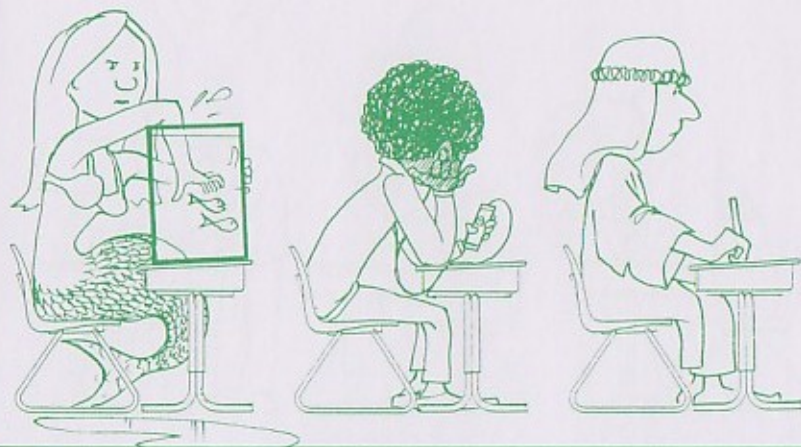


Most people pooh-poohed the rumors because the idea was so strange.



Hadn't there always been plenty of oil and gas?

No! They were discovered only
sixty years earlier, remember?
You told us yourself.



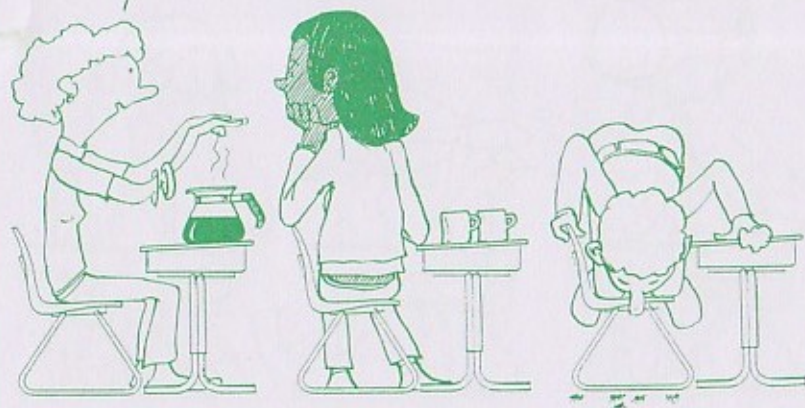
Wouldn't they continue . . . forever?

We can't wait
to find out.



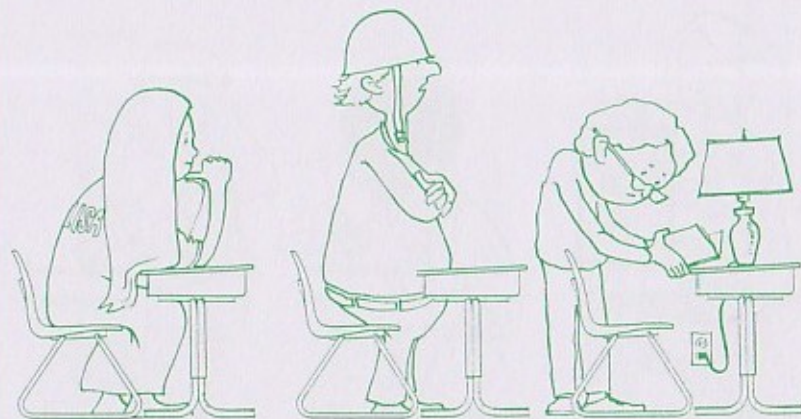
But a few people around the country listened very carefully.

Rumble-checkers,
they were called.

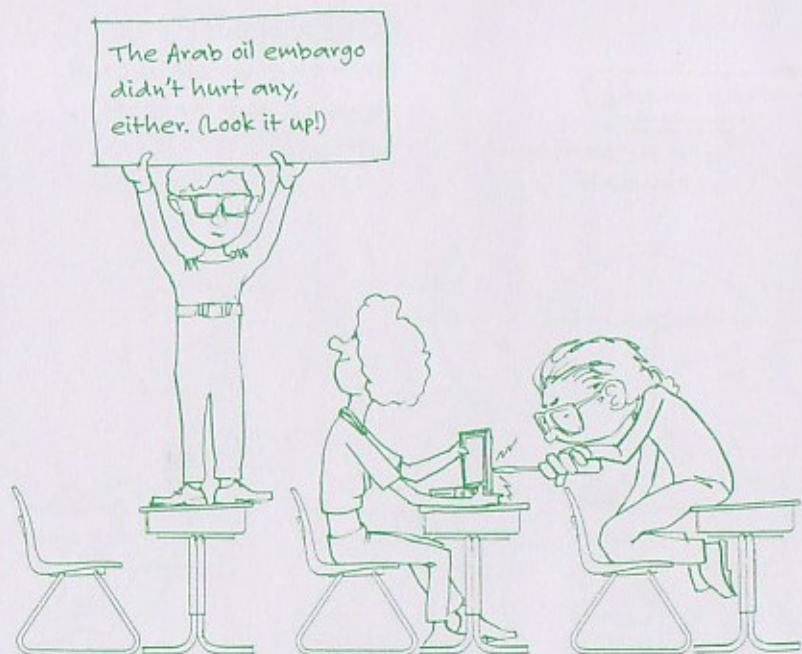


They were known as conservationists. They began to change their lifestyles so they would use less electricity, water, coal, gas, and oil.

Why use less of all
those things if only
oil and gas were
the subjects of the
rumblings?

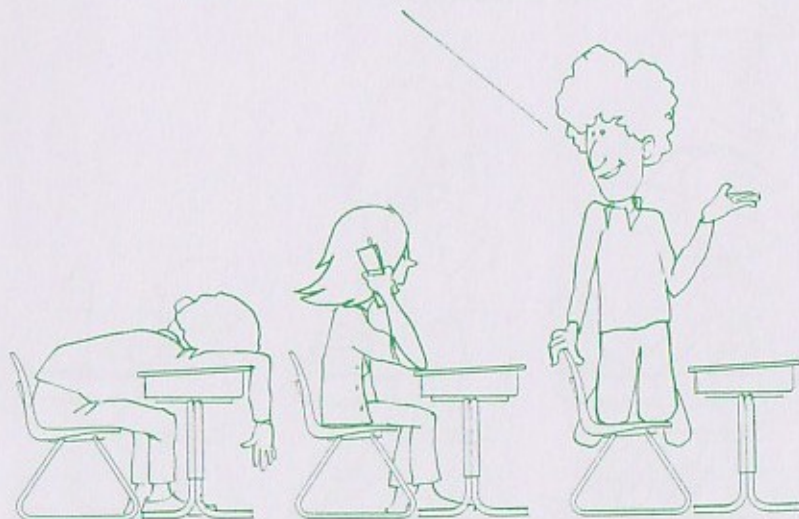


And out of their searching for ways of saving fuels grew a renewed interest in solar energy.



These early conservationists studied, experimented (one woman in Princeton placed homemade solar panels on her garage roof that heated the oven in her house, enabling her to cook and bake by the sun's free heat), and began to put their money and thoughts into solar energy.

I thought she put her oven on the garage roof and her solar panels on the printing press.



Today there are many good manufacturers of solar energy systems and many fine engineers and architects who are able to design solar systems properly.

(And just one or two unscrupulous bums out to milk the industry for all it's worth.)

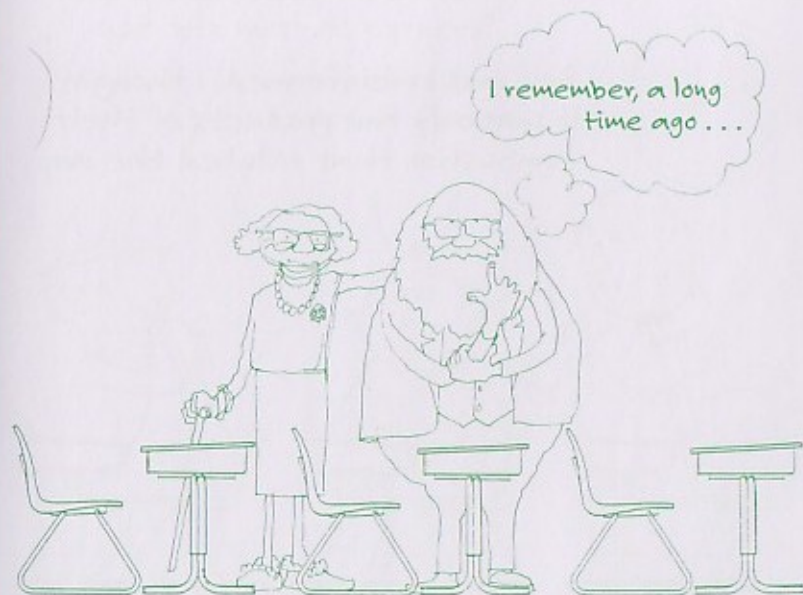


Industry, as well as government, is studying solar energy seriously as a way to stop depending on foreign oil.

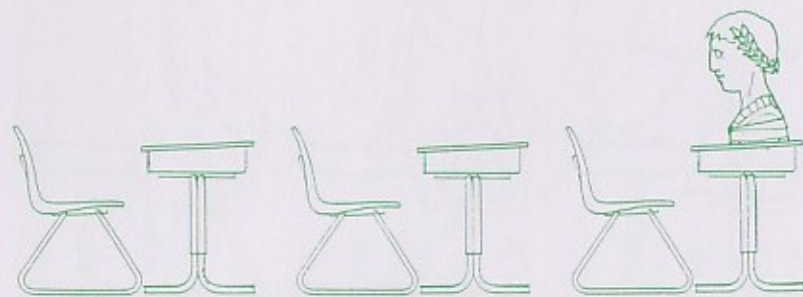
FOREIGN oil?
Isn't the whole world running out, or is it just us?



You will benefit from all this solar activity.
And some day, when you are an adult, you may
remember learning your solar energy basics.
Enjoy.

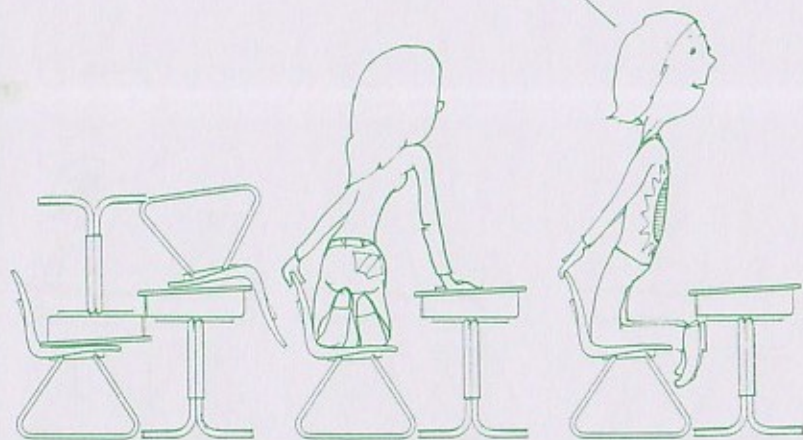


Active Solar Systems



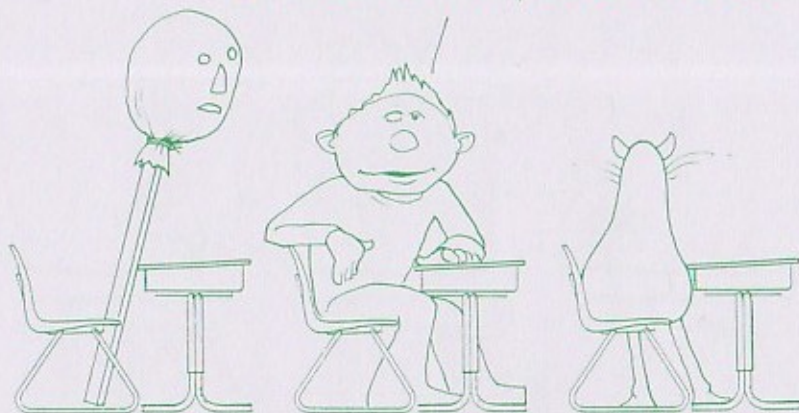
Energy from the sun is free and always available.

But there's a catch, right?
You have to do something
expensive in order to use it.



It doesn't pollute the air as oil and coal do.

Boy, was I misinformed! I thought
it was only the products of their
combustion that polluted the air.



It's a natural way of heating air and water. So you may wonder why *everybody* doesn't use solar energy instead of oil.

Is it because you can't use it in most oil burners?

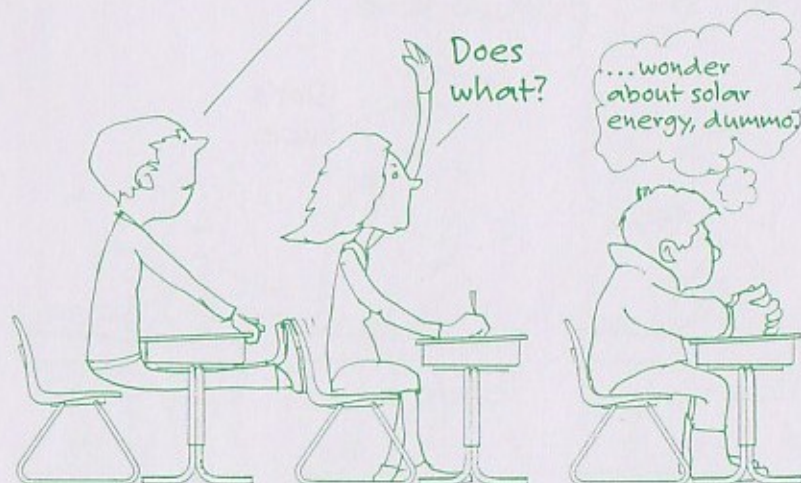


Well, in some countries, everybody *does*.

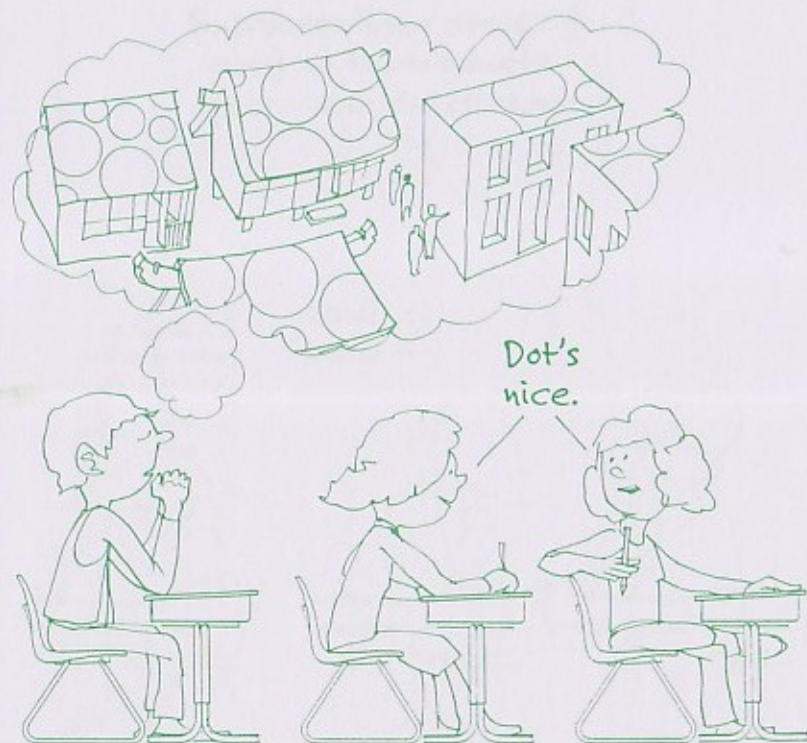
That's really shocking! I thought only a few adults did it.

Does what?

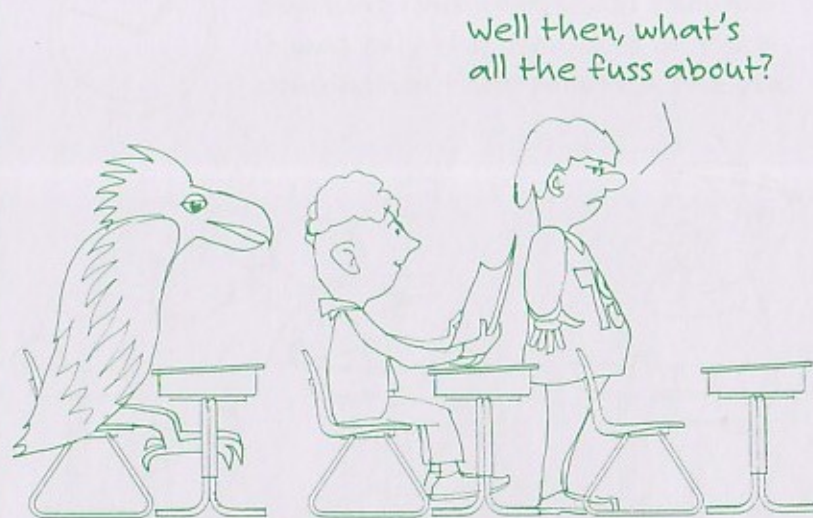
...wonder about solar energy, dummy!



In Israel and Japan, for instance, solar panels dot roofs everywhere.



That's because those countries have no oil or coal of their own and must buy energy from other countries at very high prices. America is rich in coal, but still imports more than half the oil it uses. It needs solar energy to reduce its dependence on oil imports.



Another reason everybody doesn't use solar energy instead of oil is that it's a fairly new idea.

I thought
you said the
cavemen
used it.



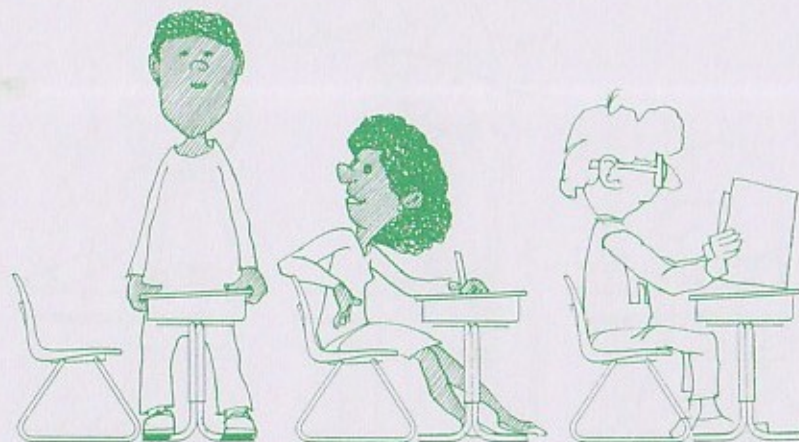
People don't quite know how it works and are a bit nervous about anything they don't understand. But in *your* world . . . the near tomorrow . . . there will be many, many more solar buildings.

If it's my world the
only kind of solar
buildings we won't
have is schools.



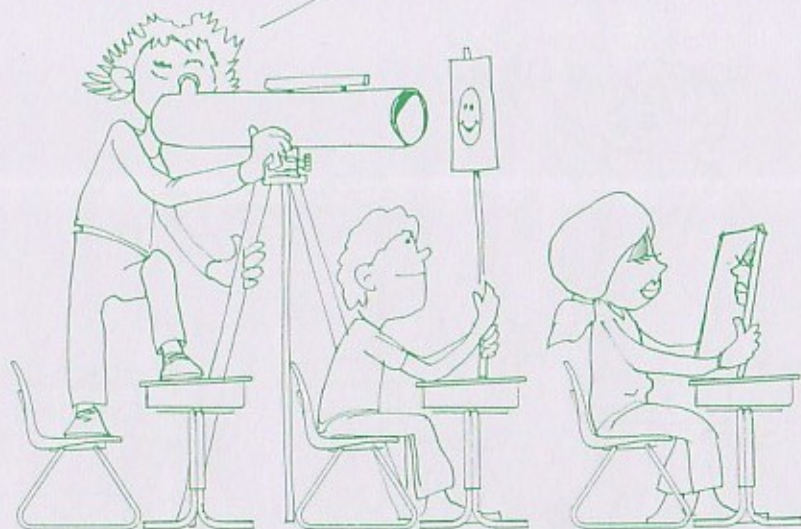
Your home will probably use solar energy. So you should know and understand what it is and how it works.

I have a feeling
I'm about to find out.



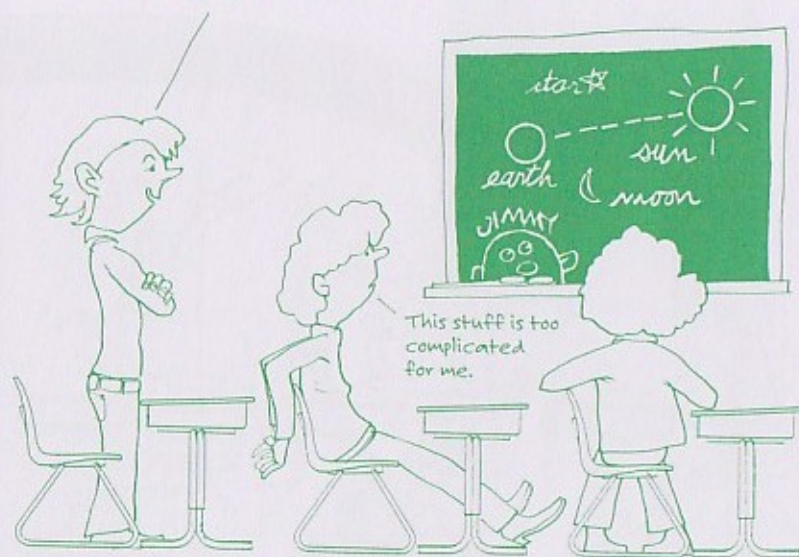
Have you learned that the sun is a star, the same kind of star you see crowding the heavens on a dark night?

I look for it
every night
but I never
see it.



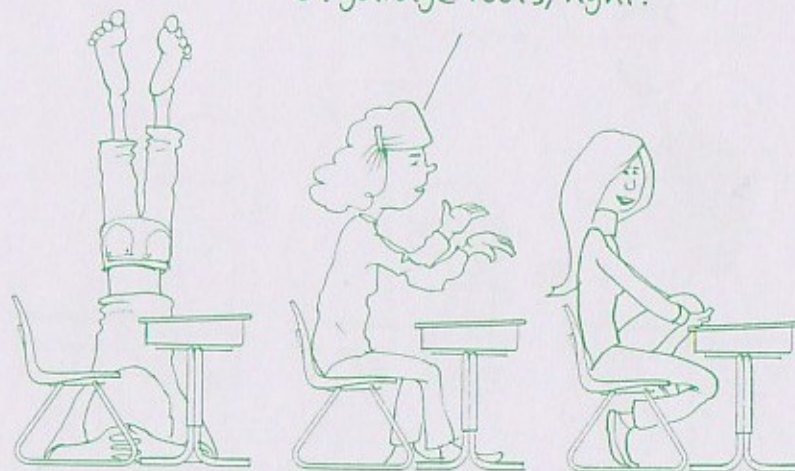
It is a light, heat, and energy star composed of burning gases.

Funny, I always thought it was more of a thermonuclear reaction brought about by the crushing forces of its immense gravitational field.



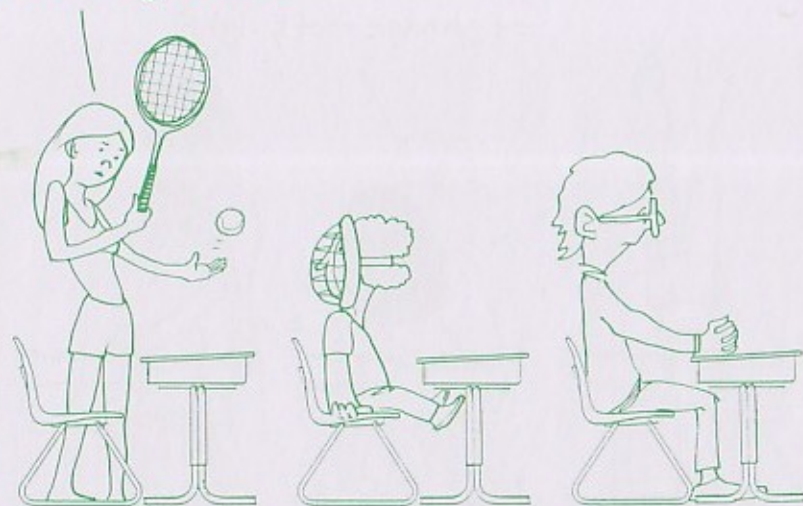
The sun is the star nearest to the earth, which turns about it, gathering up heat and light from this flaming neighbor 93,000,000 miles away.

So what's the problem if we're getting all this heat? Ah, I get it: the heat is only good for running printing presses and baking bread on garage roofs, right?



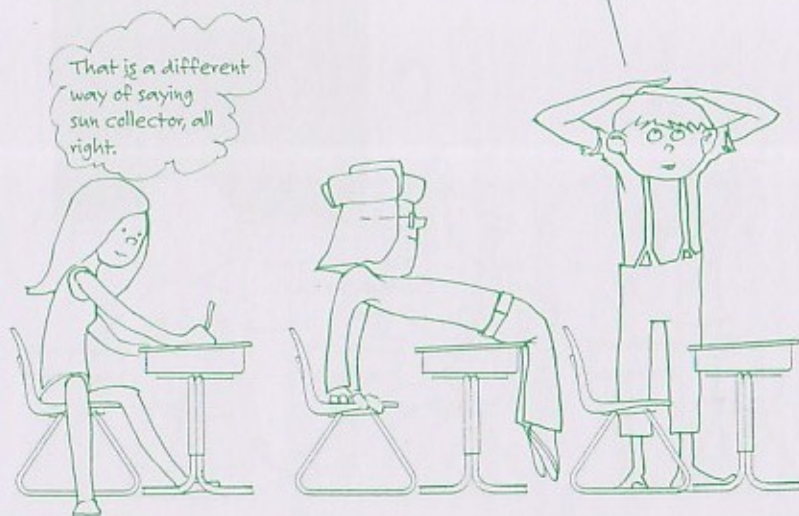
So there is the sun, giving its heat away free. But this is the problem: How do you catch sunbeams to make them work for you?

I wouldn't be greatly surprised to learn that it was necessary to employ some sort of sunbeam catching device.



One way is through the use of a solar collector, which is nothing more than a different way of saying sun collector; it collects the sun's heat.

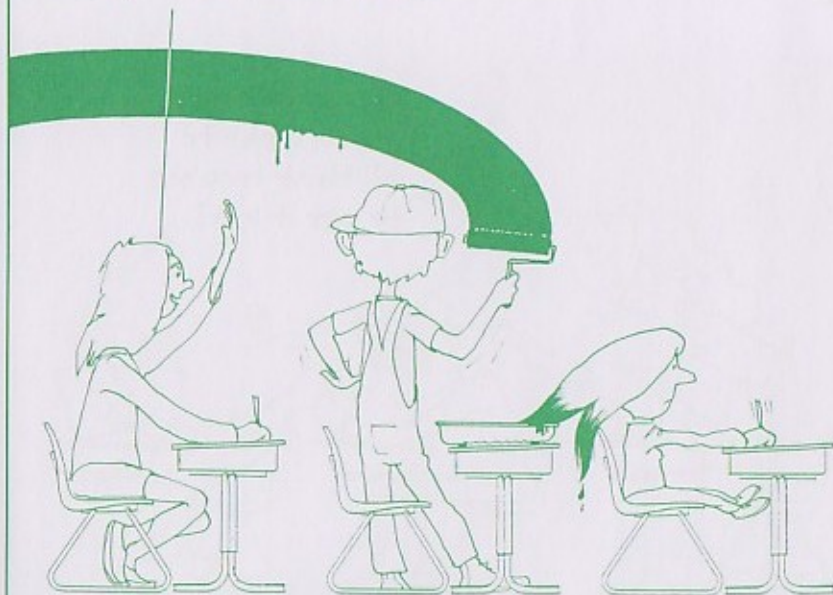
Not all of it, I hope.



That is a different way of saying sun collector, all right.

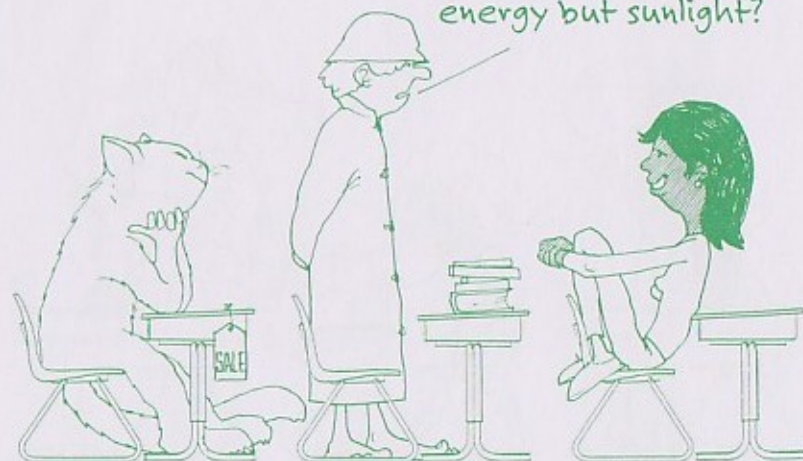
It does it the way a greenhouse works.

You fill the solar collector with plants and flowers?



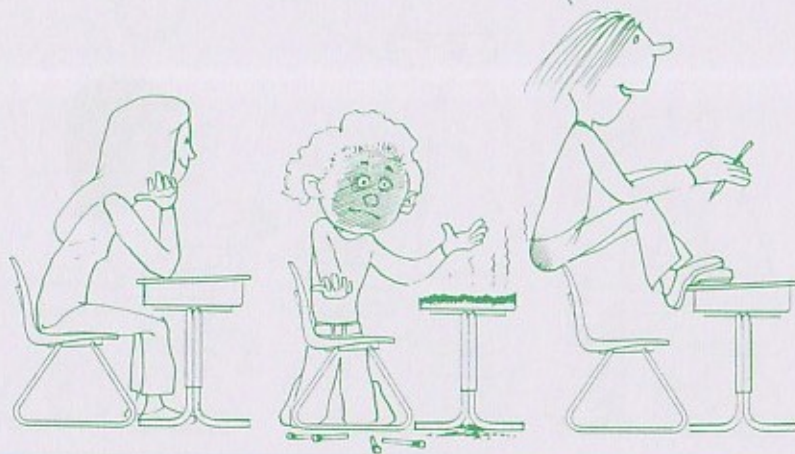
A greenhouse is made mostly of glass to catch hot sunshine through its roof so flowers, plants, and vegetables can grow in it all through the bitter winter months.

Doesn't a greenhouse use more fuel than almost any other type of building? Or are you talking about a solar greenhouse, the kind that uses no energy but sunlight?



A solar collector is usually a flat box that lies on the roof of the house.

Just like the Princeton woman's oven—or was that the Pueblo Indians?



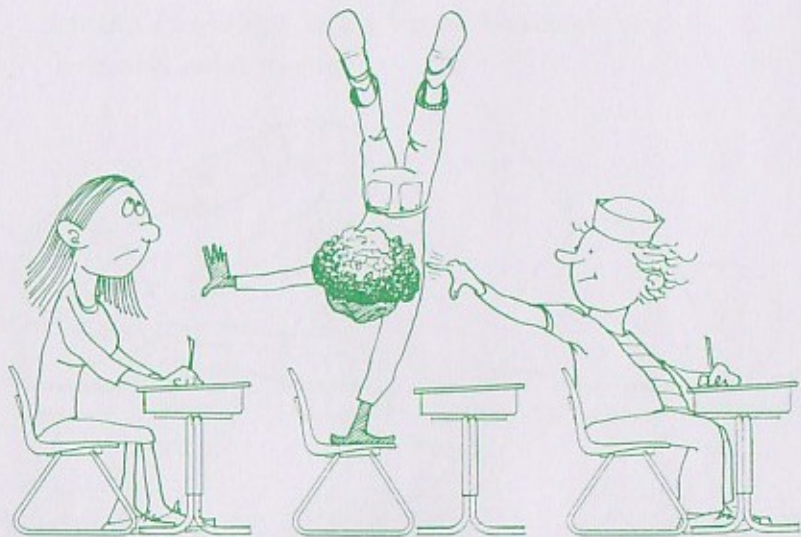
The box can be made of metal with a glass cover, just like a little flat greenhouse. But, when the sun comes through the glass and hits the inside of the box, it stops being sunlight and turns into heat. The inside of the box, which is black, gets very hot. It stays hot until water in special pipes flows over it to cool it off.

Why cool it off if you went to all that trouble to get it hot?



Air can cool it, too.

She's not listening to me.



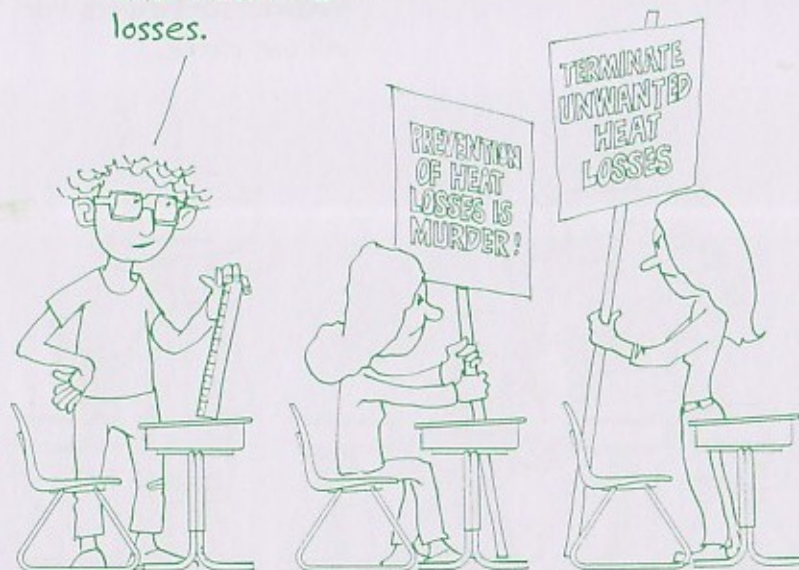
The heat is now in the water (or in the air, if you used air, but let's talk about water).

You're the teacher, Mrs. Robinson. You can talk about fabric softeners for all we care.



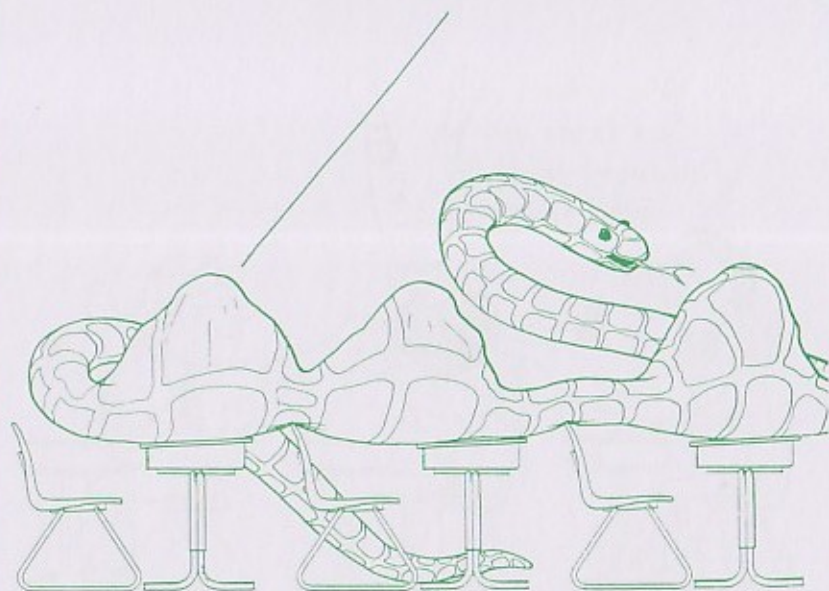
The hot water flows into a tank where it is stored.

I suppose it's a heavily insulated tank to prevent unwanted heat losses.



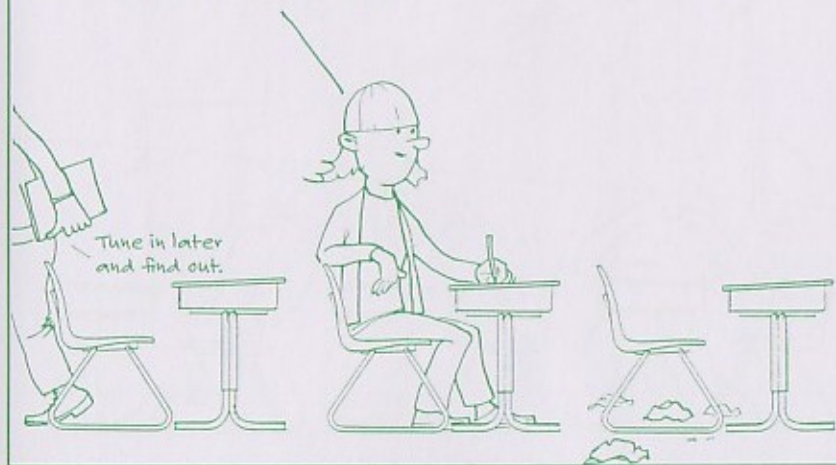
Then, when the house gets cool and heat is needed, a fan blows air past the hot water tank.

And where does the fan get its energy?
(Ain't I a troublemaker?)

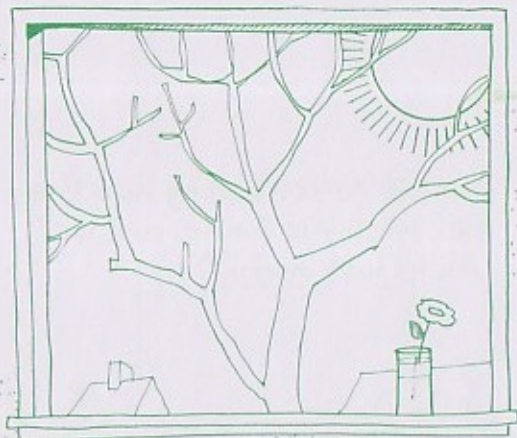


This warms the air, which then flows all through the house, eventually coming out through the grille in your bedroom.

So there we have it: the collection, transformation, and use of energy. The energy which traveled to earth only a few hours earlier as sunlight is now warming my bod. What happens next? Does the energy simply disappear? Or do I release it as heat through my breath and sweat?



Passive Solar Systems



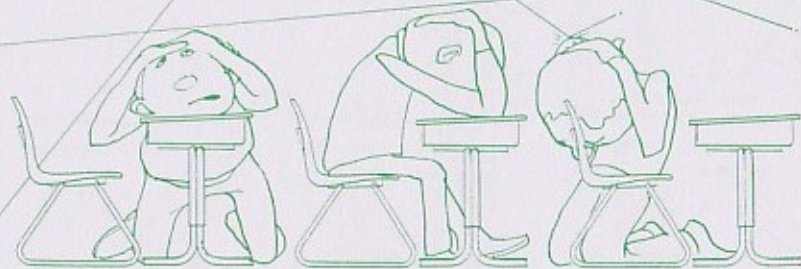
The solar collector you've just read about is part of an "active" solar system because it is made up of moving parts, such as fans and pumps, which need electricity to power them.

And we're not telling how the electricity is made, are we?
(Ain't I just awful?)



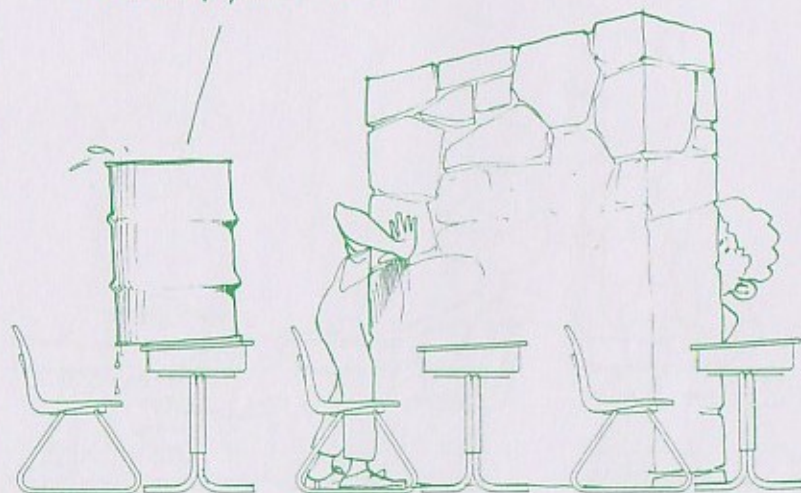
There is another solar energy system that is growing very popular with people who are interested in using the sun's energy. It is called a "passive" solar system because it has no moving parts.

Don't you consider
the billions of racing
electronic particles
"moving parts"?



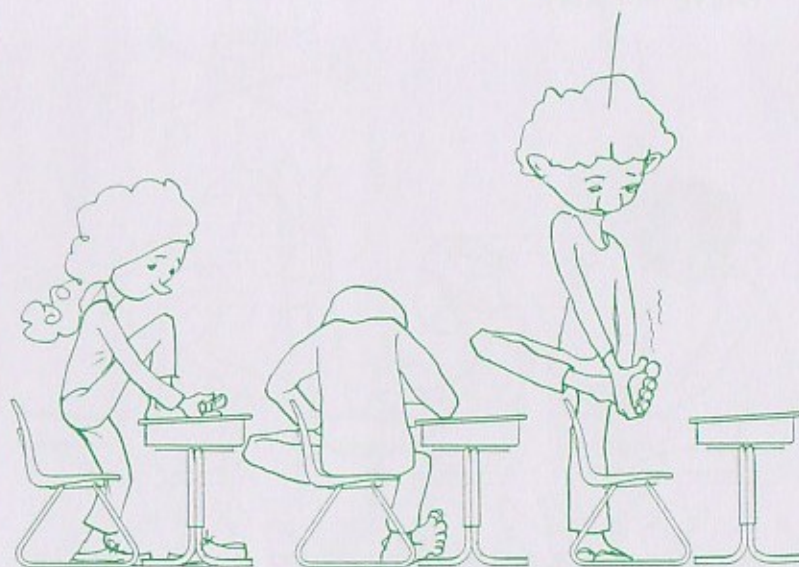
In a passive solar system, the sun heats part of the house or "something" that holds the heat, then releases it when needed. That "something" can be an inside wall made of cement, brick, or stone, called a Trombe wall. Or the "something" could be barrels of water, or a bin filled with rocks.

Will you please
make up your mind?



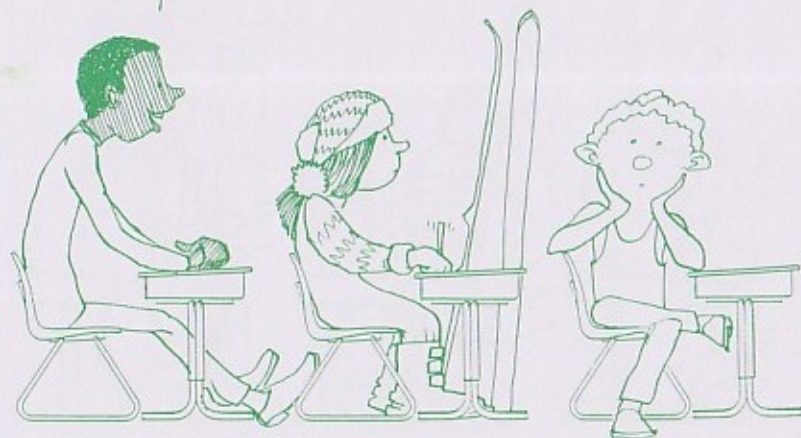
You know how you enjoy running barefoot in the summer and how, if you run out into the street, it can burn the bottoms of your feet—it's so hot.

Passive solar energy
burns your feet?



Even at night, long after the sun has gone down,
the street is still warm to your feet.

It was stupid of me
to keep standing out
there all day.



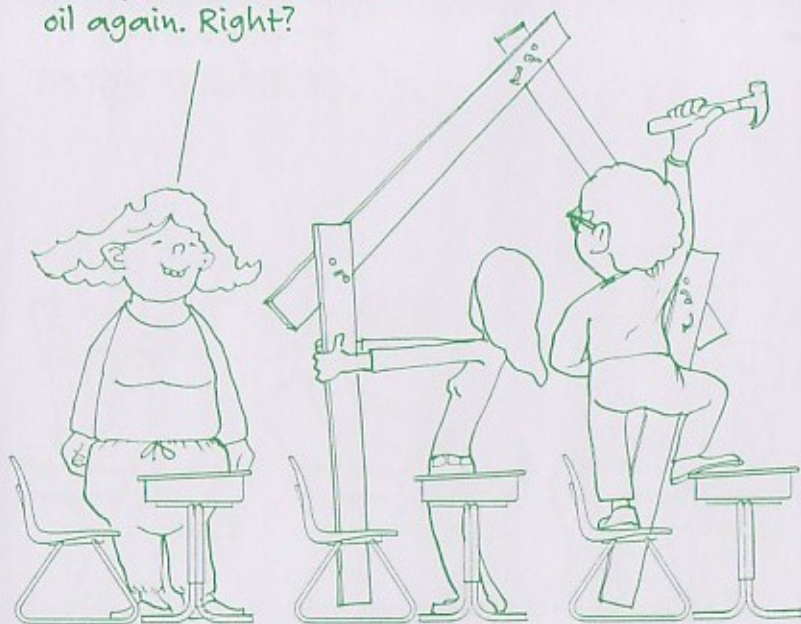
Well, that's how passive solar energy works.

I knew it. It's
a foot-burner.



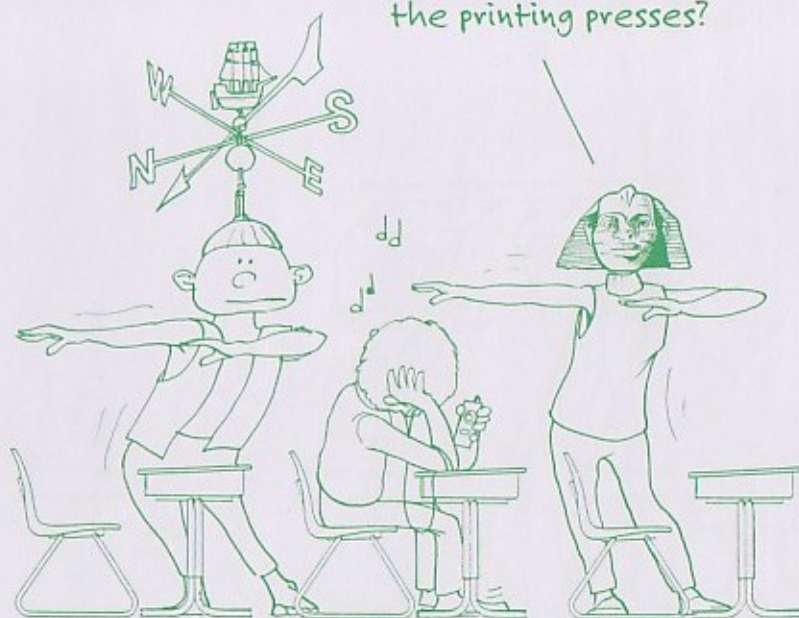
The street catches the sun, holds it all day and even through the night.

So build your house in the middle of the street and you'll never need oil again. Right?



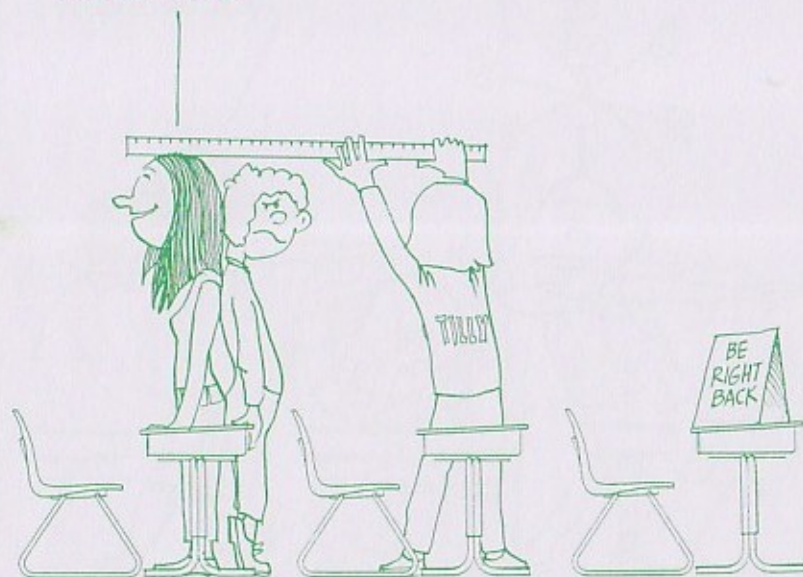
Some new houses are being built with twice as many windows facing south as towards the north. The reason?

Let me guess: to run the printing presses?



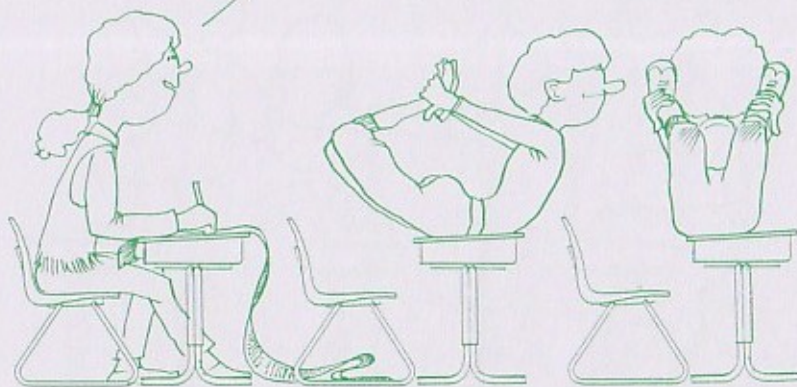
The sun shines from the south, and this gives a house the chance to "collect" the warmth—the same way a solar collector collects sunlight.

Just like a little flat greenhouse.
I remember.



Some people are building greenhouses on the south side of their homes.

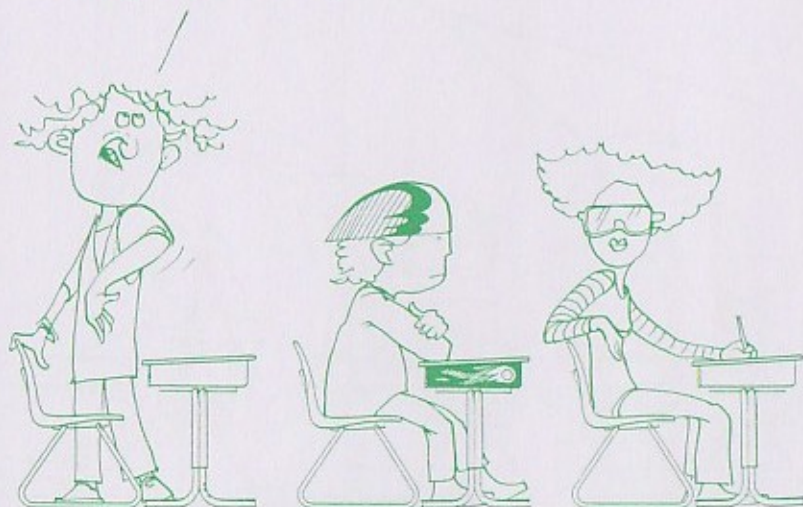
Then shouldn't the
greenhouses be
called greenhomes?



That way, the greenhouse collects the sun all day, storing its warmth in water containers or in rocks. This very heat warms the house when it gets cold.

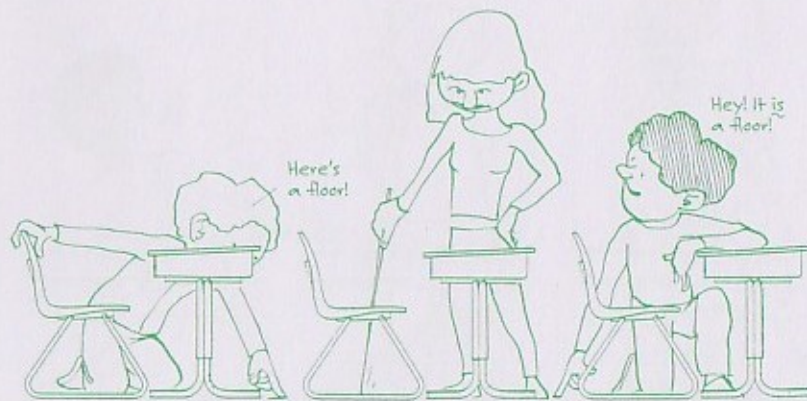
Another kind of passive system is to have water-filled tall plastic columns behind windows of a house to absorb the sun's heat.

They sound lovely.



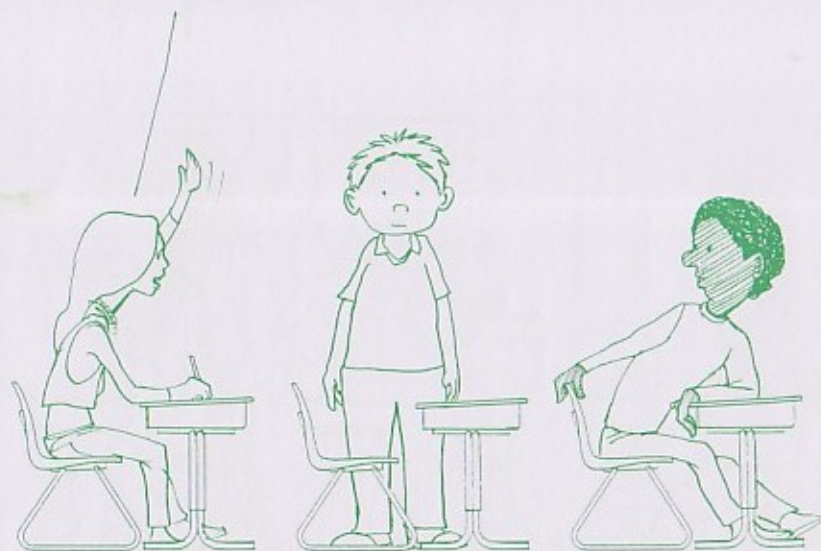
Also, instead of having a stone or cement wall standing upright, a concrete floor (which is like a wall, only it's lying down) ...

So that's what a floor is!



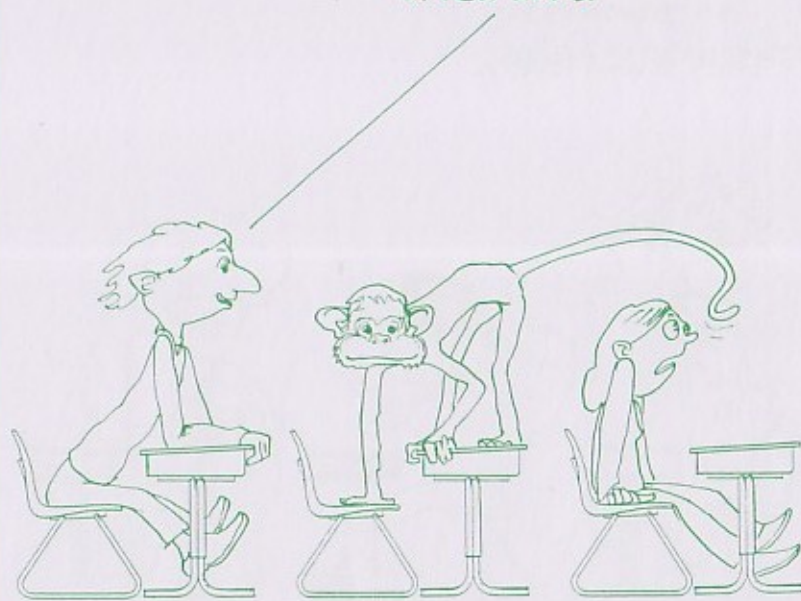
can serve as a collector of sun scooped up by south-facing windows.

Sounds like quite a house,
with walls lying on the floor
and plastic water tanks
all over the place.



It's really simple to make the sun work for you.
All you have to do it open the room to sunshine
through windows.

And knock over
a few walls.



Then, when the sun goes down, close off the windows with heavy shades, drapes, or indoor shutters. That way you trap the sun's heat in the room.

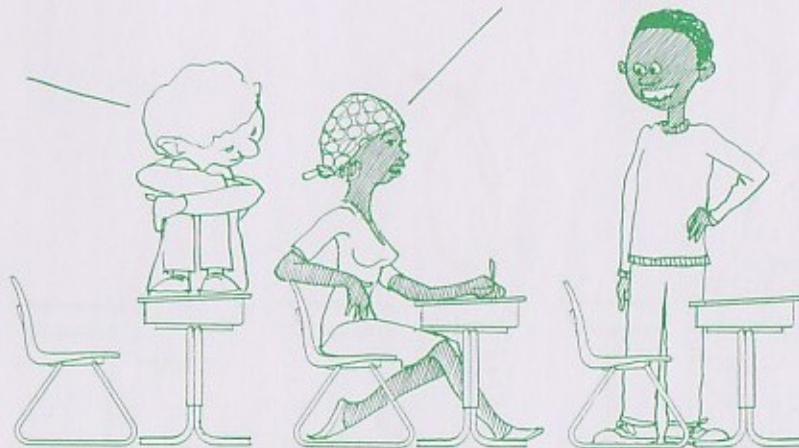
With the heat in the room, the place should be quite toasty.



Some good points about "active" solar heat are:

1. It is easier to control the amount of heat you get and where it goes
2. It can be added to houses that are already built, much more easily than "passive"
3. There are many solar companies that understand and can install active systems.

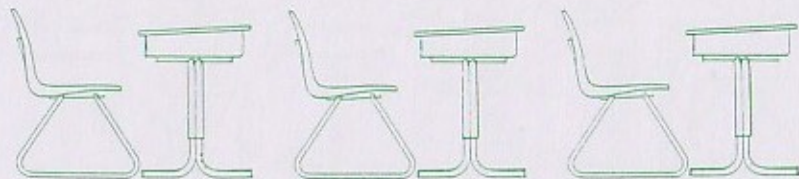
And they're all honest and dependable, right?



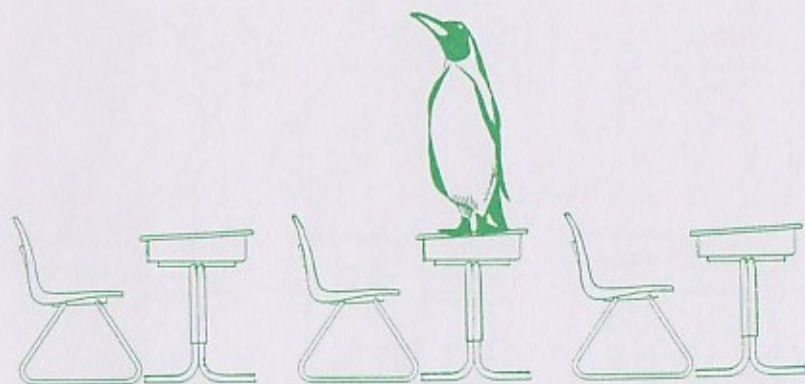
Some good points about "passive" solar heat are:

1. It uses no electricity
2. It often uses parts of the house (such as walls or the floor) to store warmth
3. It doesn't need as much care as an active system.

That's nice.

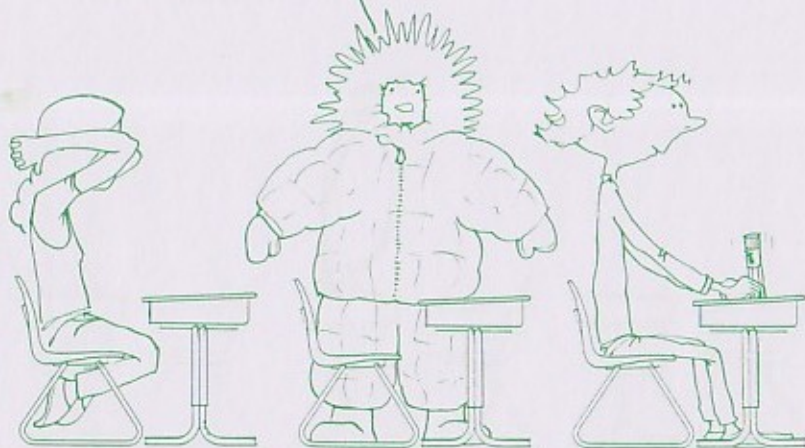


Insulation



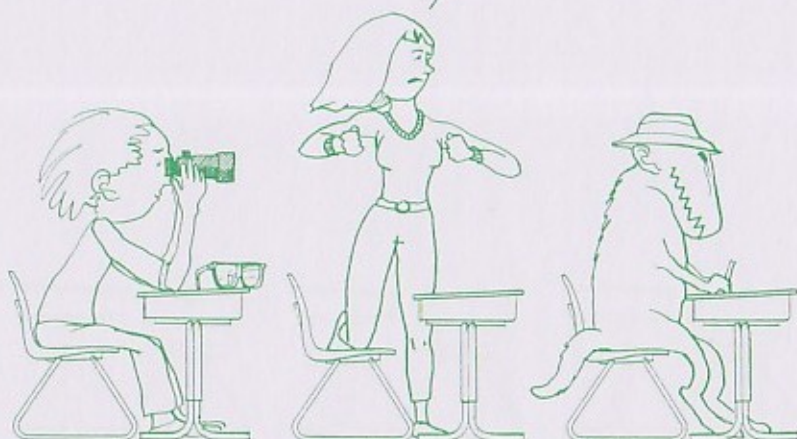
Neither of the two systems, active or passive, will do a house much good if the house is not insulated.

Do you mean a little bit insulated or extra super well-done insulated with every crack sealed against air infiltration?



Is that a new word for you?

Come on, Mrs. Robinson, I'm 12 years old, remember?



It means putting a blanket between the house and the outside, keeping the heat on one side, the cold on the other. There are many ways of accomplishing that.

And we are about to hear of them, I suspect.



Perhaps you've seen television commercials about insulating the attic, where a man is seen laying down material on the floor of the attic.

Is he about to make a new dress?



That is an excellent way to keep the house's heat in the house, where it belongs, instead of in the attic, where nobody lives.

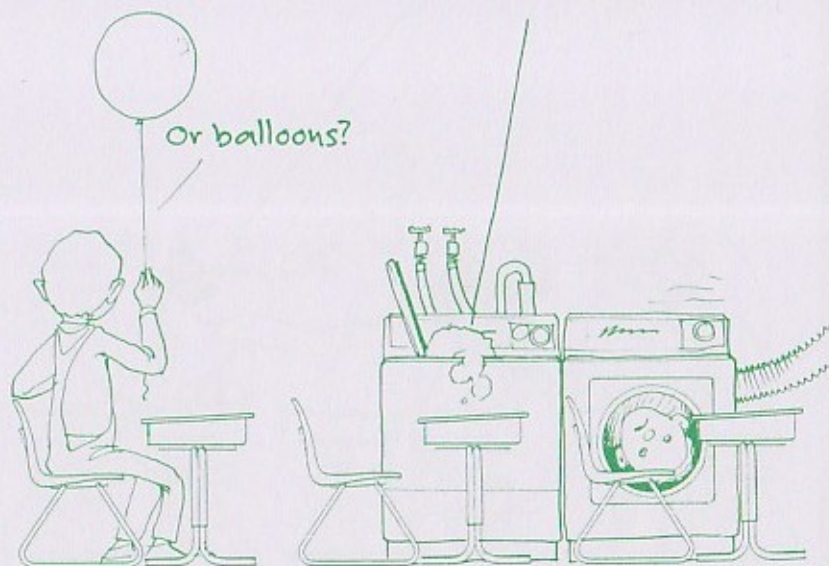
Except for that poor dressmaker up there.



Insulation is any material that traps air and does not permit heat to pass through easily. It could be cork, paper, different types of plastics that have bubbles caught in them, sponge, rock-wool, glass-wool, fiberglass, or other products.

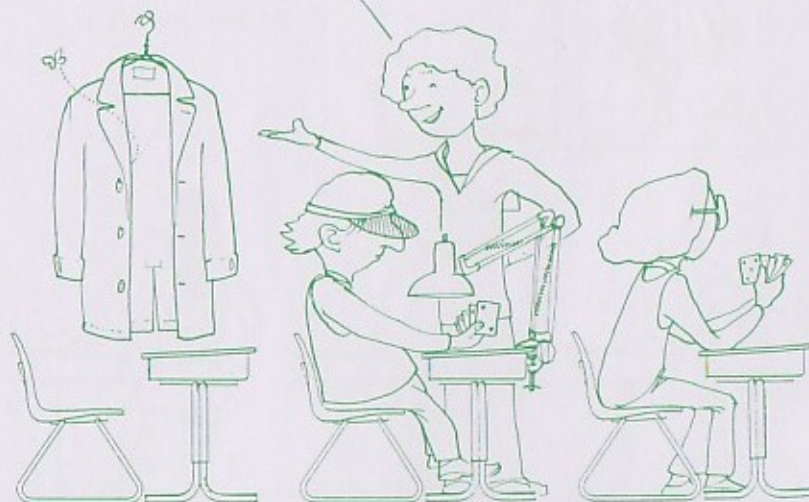
How about soapsuds?

Or balloons?



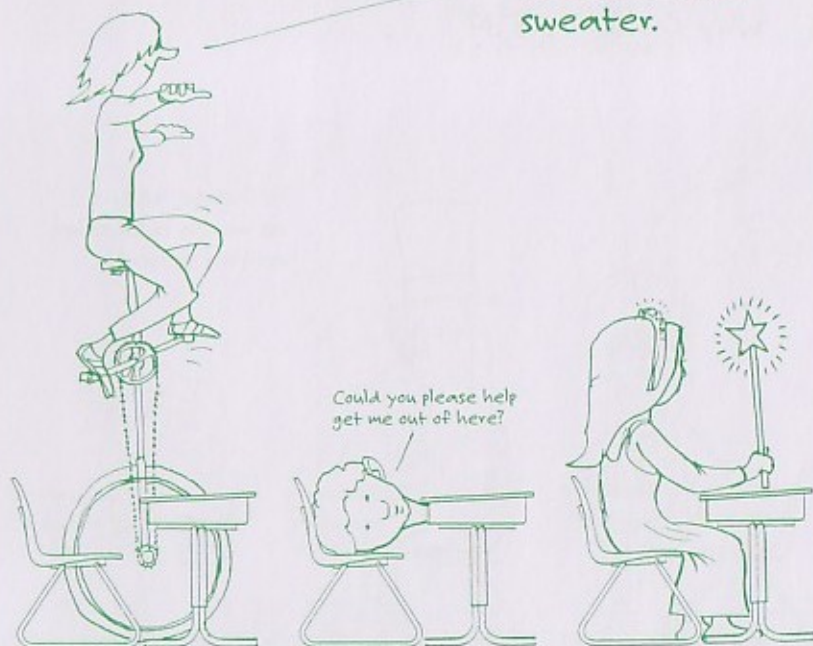
Air itself is insulation, probably the best, and we know that wool (wool winter coat, wool sweater) is an insulator because it does not allow your body heat to escape.

I just checked my wool winter coat and, sure enough, my body heat is still in it.



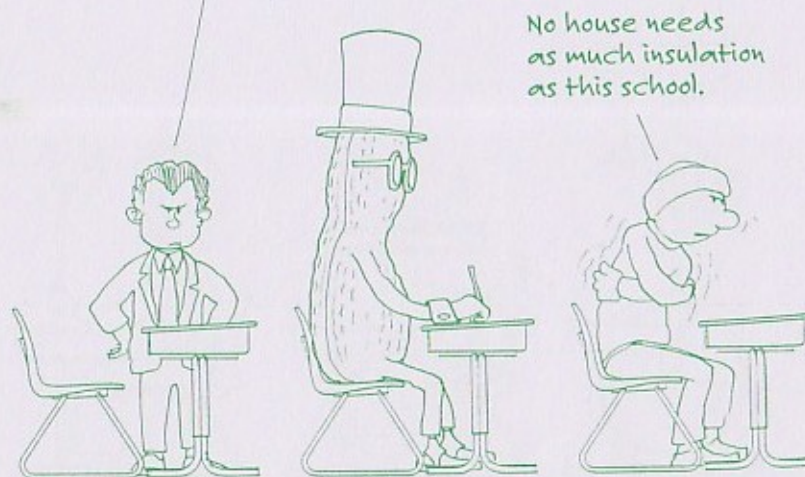
There are many places in a home that need insulation.

And we're going to stuff each one with a wool sweater.



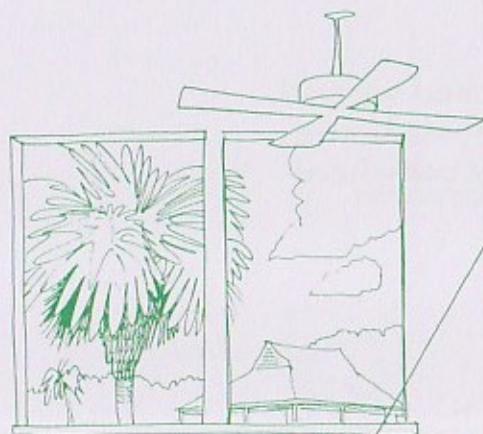
It might be a good idea if you went around your own home and checked off the following:

Wait a minute. I'm only a kid.
Why should I do it?

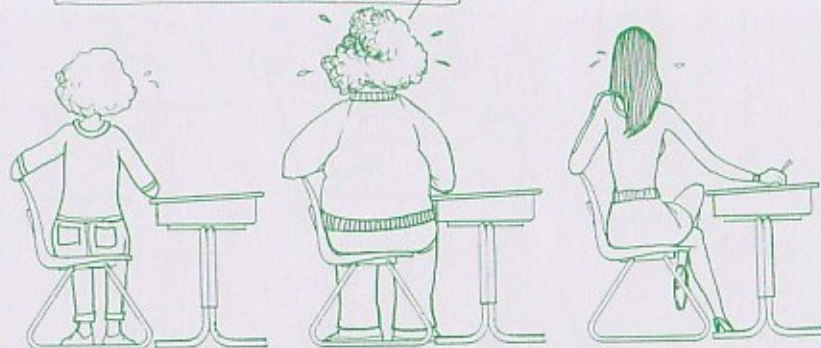


No house needs
as much insulation
as this school.

1. Do you feel air leaking in around windows and doors?

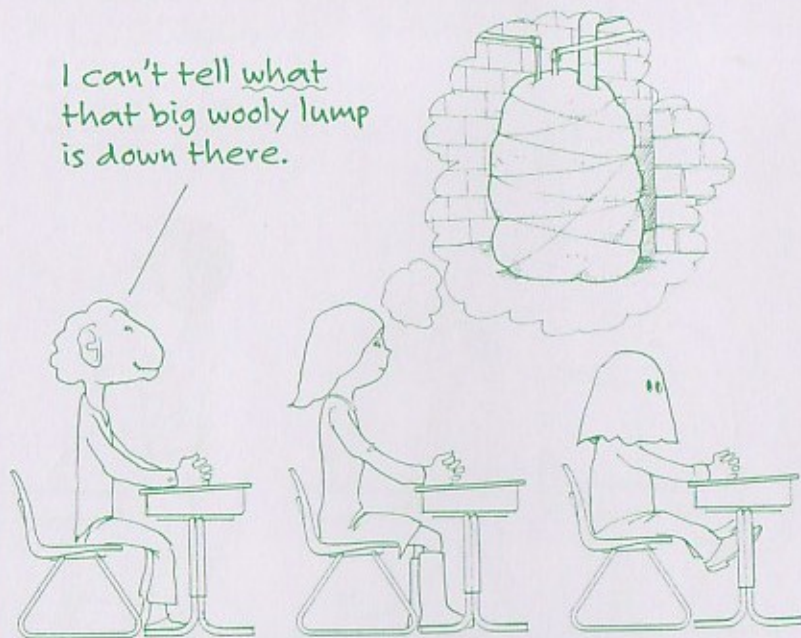


Yes, and it's
such a relief in
a heat wave
like this.



2. Does snow on your roof melt more quickly than on the roofs of neighboring houses? (That's because the heat in your house is escaping through the ceiling and the roof, and melting the snow.)
3. Is the hot water heater in your basement covered with insulation? If it isn't, some of the heat escapes into the basement, where it is wasted.

I can't tell what
that big wooly lump
is down there.



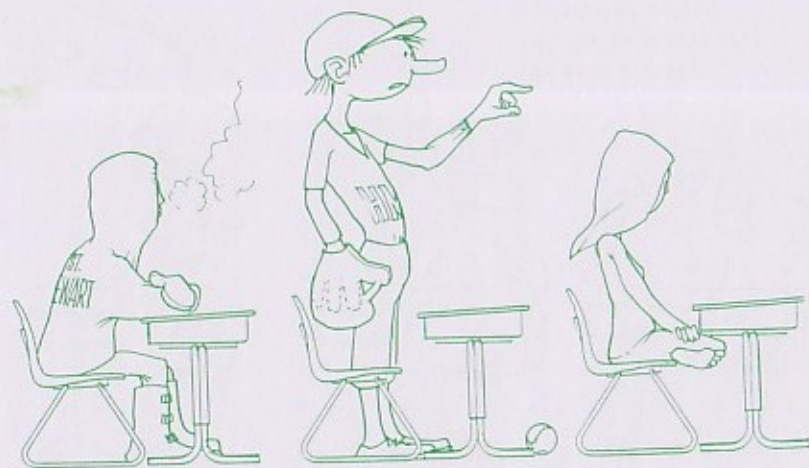
4. Are drapes closed and shades pulled when the sun goes down?

No, we have to
do it ourselves.



That keeps the heat in, the cold out.

Well, some of it, anyway.



5. Are there storm doors and windows in your house?

No, they're all on the outside.

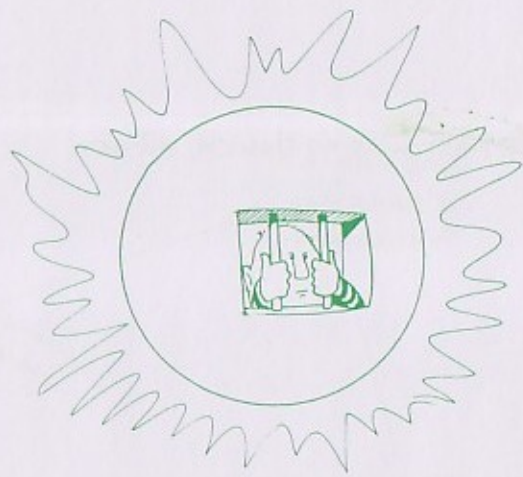


Discuss these things with your parents. They will listen closely to what you say because it means saving money as well as energy.

I can see it now:
"Sit down a minute, Dad.
Sit down, Mom. Even though I'm
just an obnoxious little 12-year-old
you'll want to listen closely to what
I say because I've just heard Mrs.
Robinson's 5-point checklist."



Solar Cells



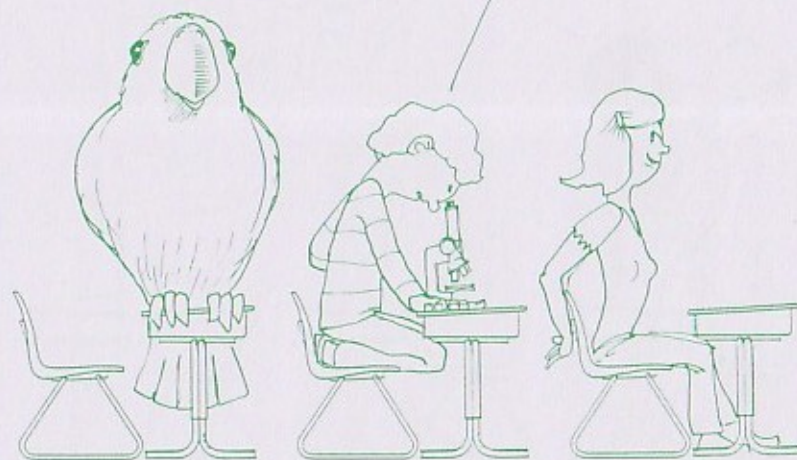
Solar energy has a wonderful future!

Its past was no slouch, either.



One of the most unusual tricks is something called a solar cell. Usually the size of a silver dollar, a solar cell can be as small as the head of a pin.

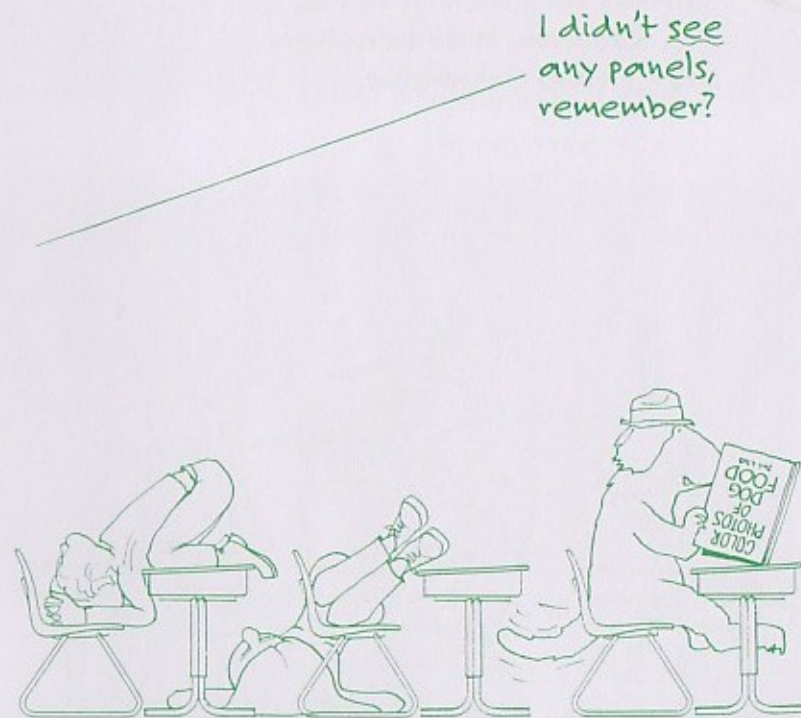
Must pick up a lot of sunlight on a surface that big.



You may have seen photographs of solar cells and not even known you were looking at them. Remember seeing a photograph of a space satellite? It had large, wing-like panels coming out of it, didn't it?



You may have thought those panels helped the satellite to "fly."



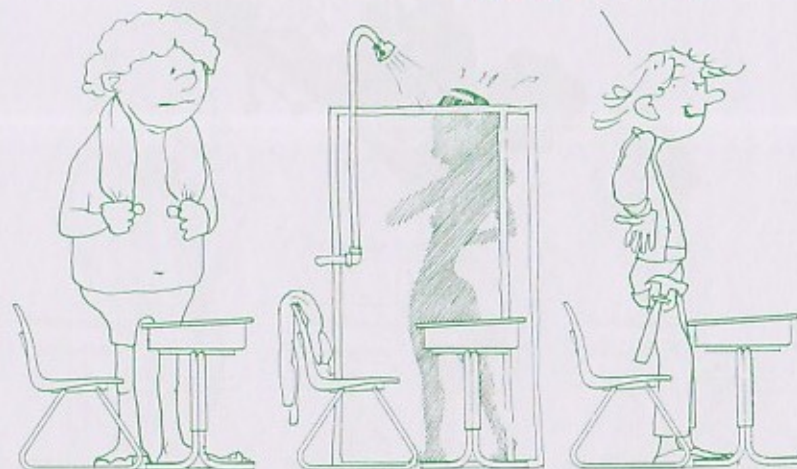
Well, in a way, you were right.

Thanks for listening to me,
Mrs. Robinson. Most teachers
aren't that responsive.



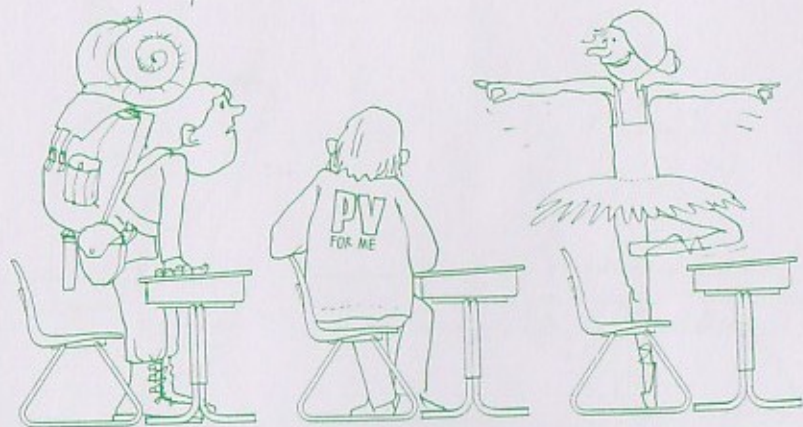
But it's not the way you think. Those "wings" hold solar cells in them and when the light strikes those cells, the special material they are made of changes the light to electricity, needed to power all the electrical equipment on the satellite.

So you're back
on those wings
again, are you?



The special material is called photovoltaic
(foe-toe-vol-TAY-ik) . . .

Is that the way you
talked to the caveman?
Why didn't you just say
"P.V." like everyone else?



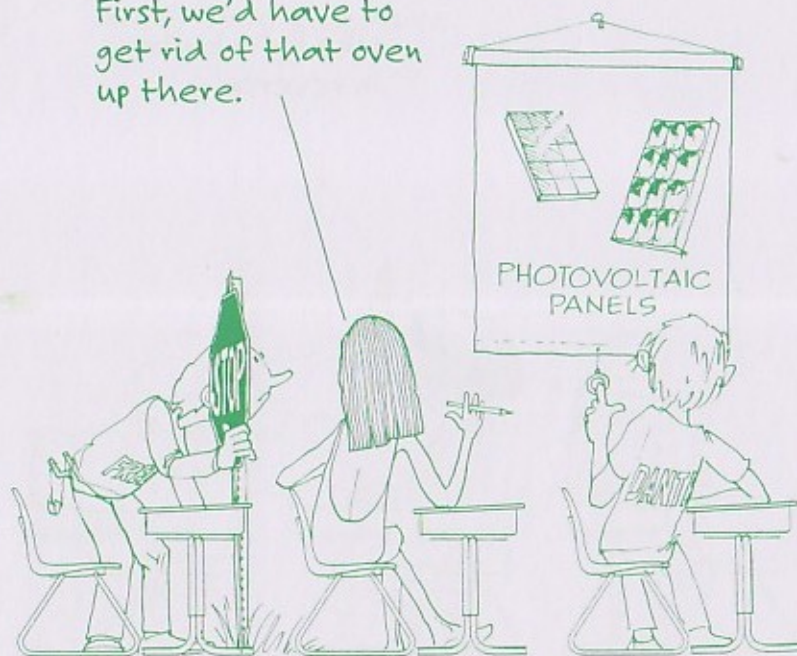
material, and that's where the big news of solar
energy will be coming from in *your* lifetime!
Photovoltaic solar cells can convert light into
electricity.

Like light bulbs
in reverse.



Imagine this . . . the roof of your house covered with tiny solar cells. That would mean *all* the electricity you might need (stored in batteries) would come right from your roof.

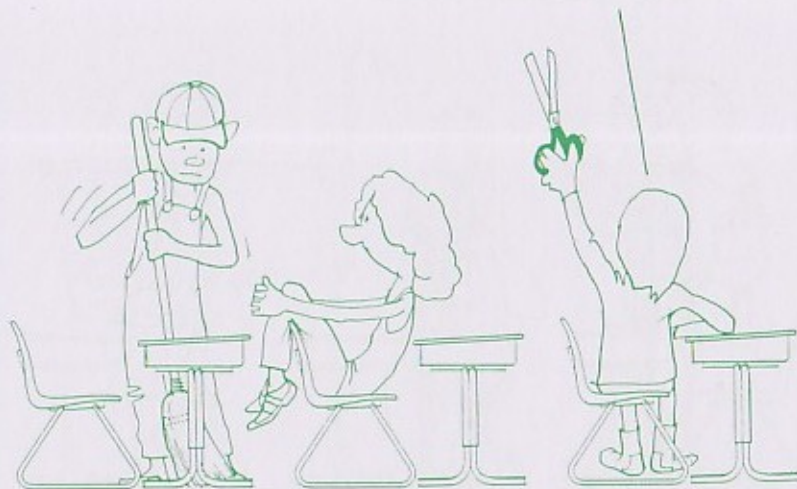
First, we'd have to get rid of that oven up there.



You could cut the wires that hook you up to the nearest electric company; you wouldn't need their power anymore because your house would produce its own.

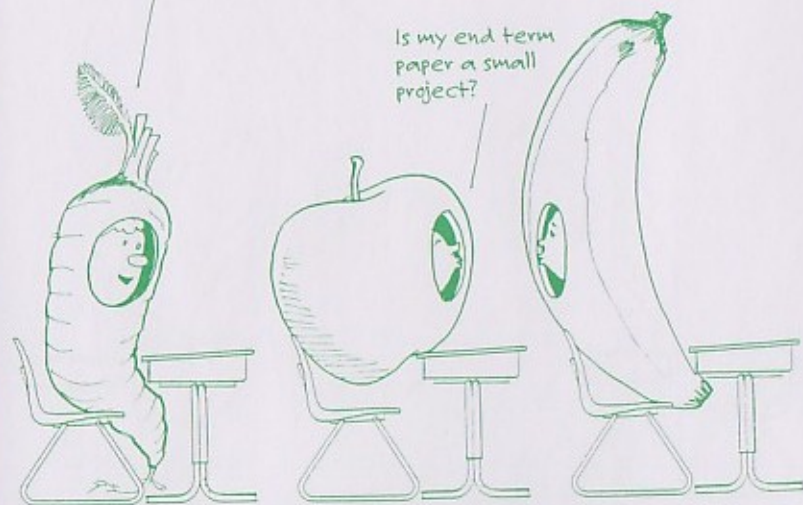
In fact, you could even sell power back to the electric company during the times when your rooftop solar cells produce more power than you need.

You wouldn't need their power anymore because you'd be dead from trying to cut those wires.



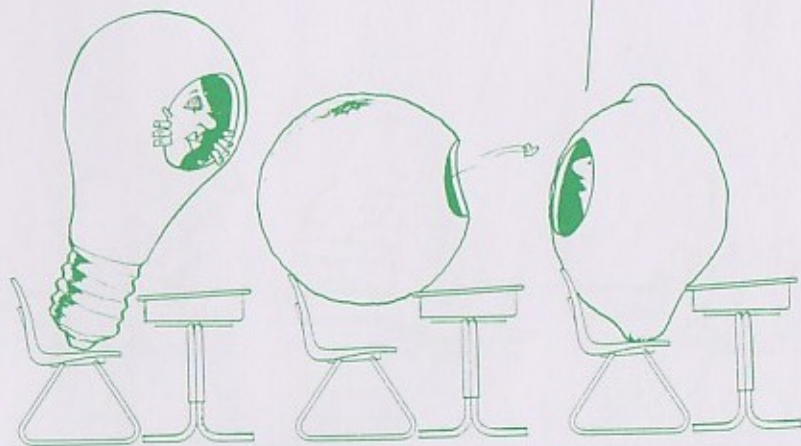
Now you know that solar cells are already in use in satellites' "wings"; they are being used everywhere in the world where there is no electrical wiring for small projects.

Because most people
don't need wings.



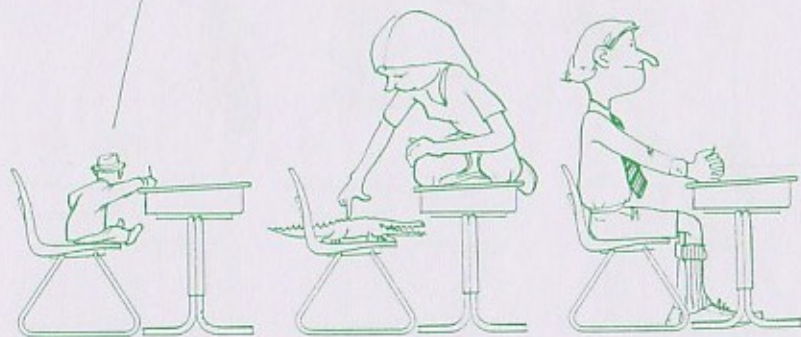
You've probably seen solar cells along the highway, powering emergency telephones. Look at your pocket calculator—it may be powered by solar cells. Photovoltaics are already being used to cook with, for light, to work the vacuum cleaner, to warm every room in the house.

We need pockets
for our calculators.



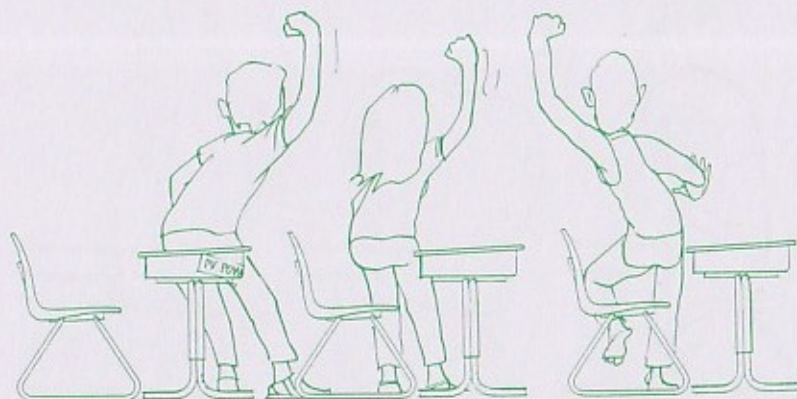
So why don't we have them everywhere today?

I'll say! Where do I sign?
Put me down for 200 of them.



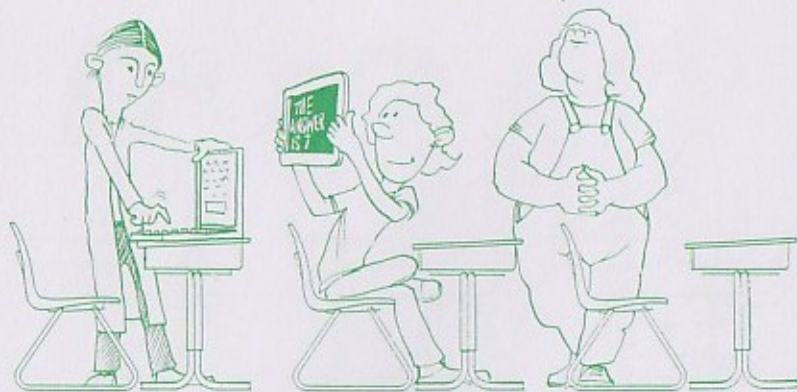
With oil, coal, and electricity costing so much,
wouldn't it be great if everyone could use solar
cells to solve a good part of the energy problem?

COOL!



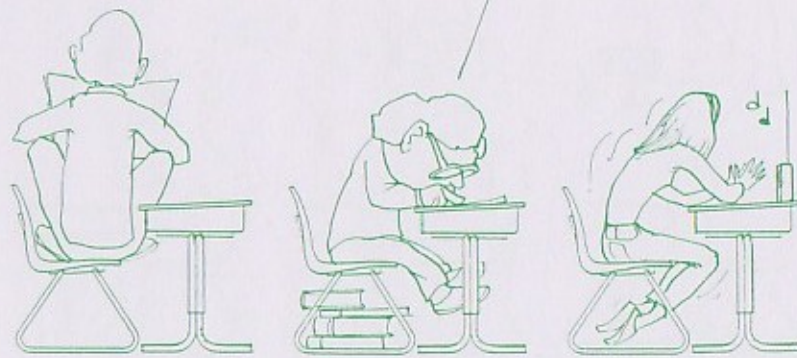
Solar cells are presently undergoing experiments and improvements in their technology in business and government laboratories. In fact, the most promising new idea is "thin-film" solar cells on sheets of plastic.

Wouldn't they work better outside or up on the laboratory roofs?



One of the biggest problems with today's solar cells and the thin-film solar cells is that they can only convert about 20% of light into electricity.

The other 80% is converted into heat, which has no known use.



Until they can be made more efficient than that, their price will often be higher than traditional energy sources.

Mrs. Robinson, I'm just like solar power. I'm only about 20% efficient.



Soon solar cells will be mass produced, which will help make them cheaper to buy. They will work much better than they do now, and you will be able to use them to make your own electricity.

Isn't that exciting?

Exciting?
It's absolutely
shocking!



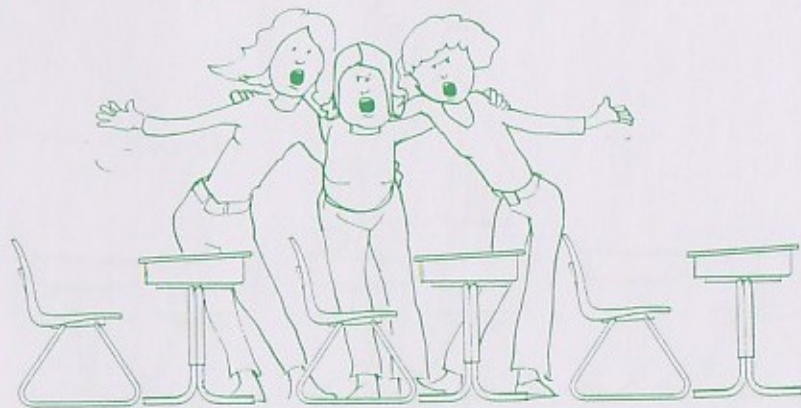
Actually, all three types of solar power systems . . . active, passive and solar cells . . . will be combined to make houses, schools, hospitals, museums, concert halls, and businesses warm and comfortable.

Municipal buildings, airport terminals, and army barracks will just have to make out with high-priced oil.

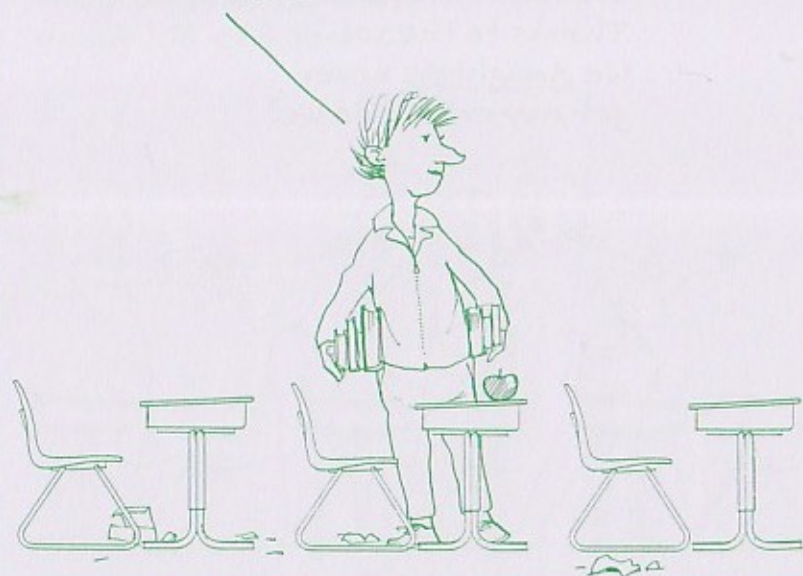


It will be done at small cost, thanks to the sun. It will be done with little pollution, thanks to the sun. And one of our biggest problems . . . energy . . . will be partly solved, thanks to the sun.

"Thanks to the son.
Thanks to the son.
Thanks to the son."
We daughters never
get any credit, do we?



Wait a minute. What's this,
the last class? Well, Mrs. Robinson,
you really outdid yourself, and I
congratulate you. But before you
go, how about showing me a few
experiments I can do—things to
keep me off the streets and
out of trouble?



Energy Experiments

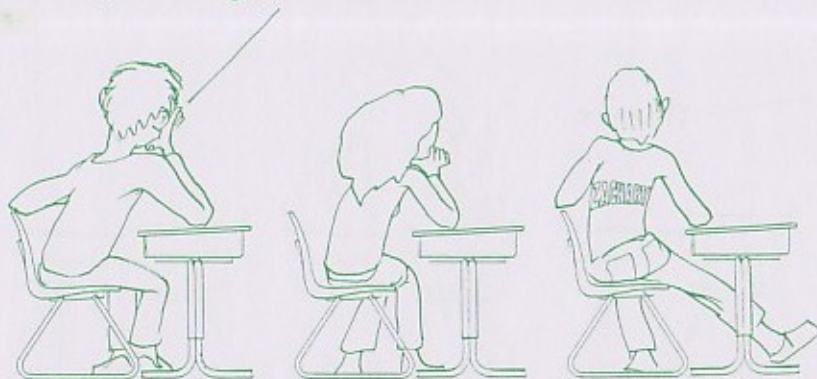
Thanks.



Demonstrate Burning Gases

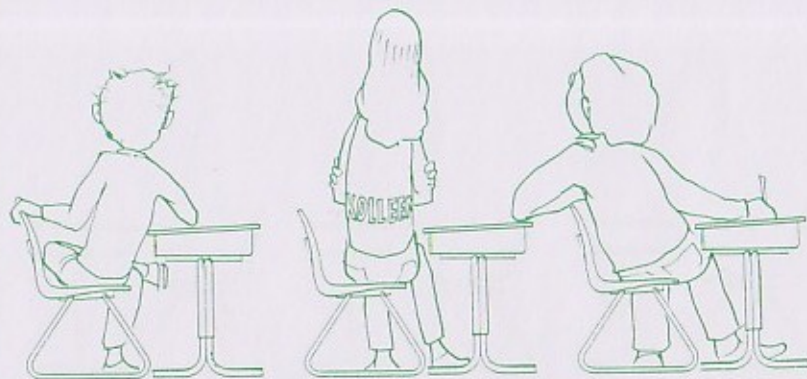
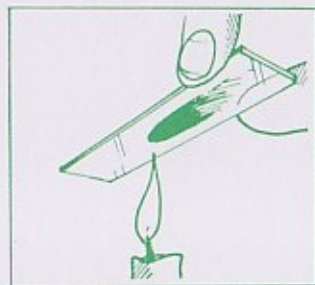
Light a candle, let it burn a few moments, and then blow it out. Quickly bring a lighted match close to the wick, but do not touch it. The flame will appear to "jump" to the wick from your lighted match. The flame is not really jumping—it is igniting the *hot gases* that are still rising from the wick.

More than any other thing you've told me, this experiment has proved to me that solar heating is a practical solution to today's energy problems.



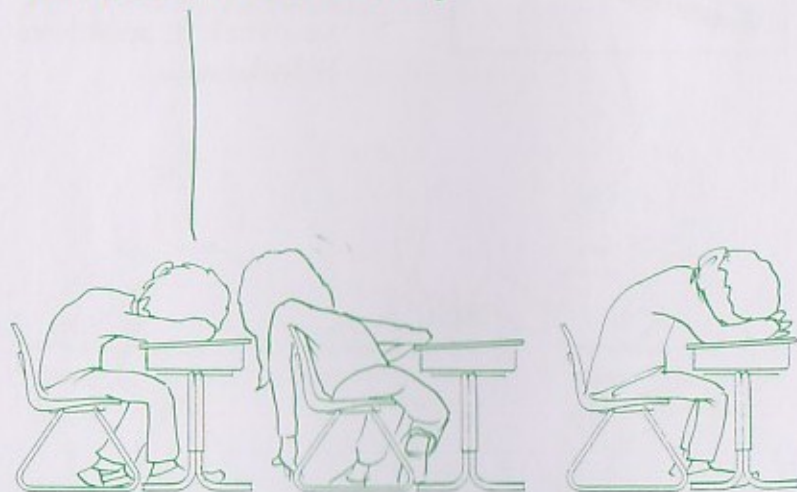
Demonstrate Pollution from Combustion

Hold a lighted candle under a clean piece of glass. The spot that forms on the underside of the glass can then be wiped with a tissue.



The dirt (carbon) on the tissue can be circulated in class to show pollution given off by the flame.

The thumb and forefinger can be circulated to show the principles of meat roasting.

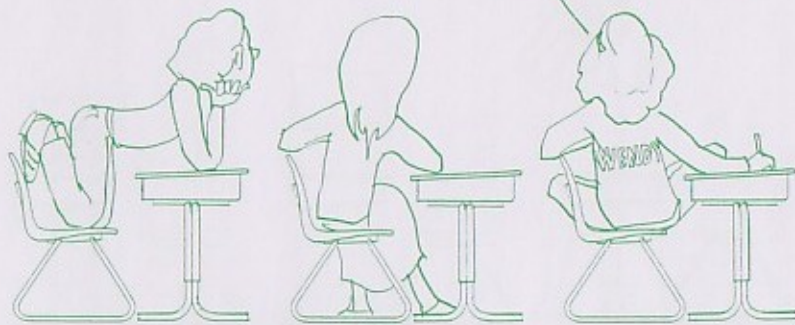


Demonstrate the Effect of No Sun

Use two small, potted plants. Put one in a small, light-tight box (a shoebox is fine) and the other beside it, open to the sun on a windowsill. Water them equally, as necessary. Note the progressive deterioration of the sunless plant over a period of weeks.

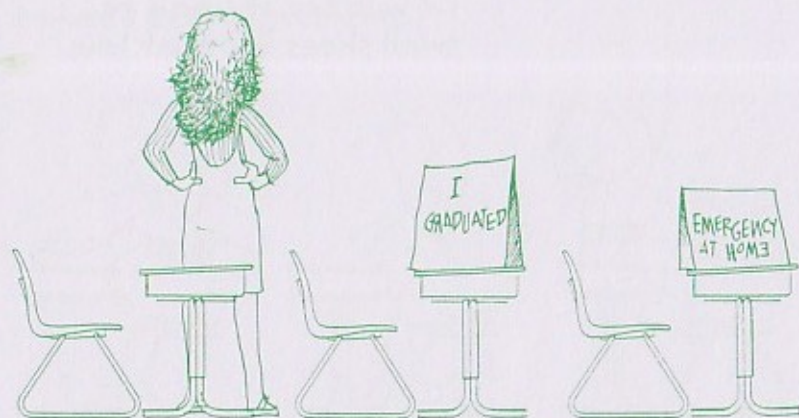


I'd wilt, too, if I had to smell shoes for that long.

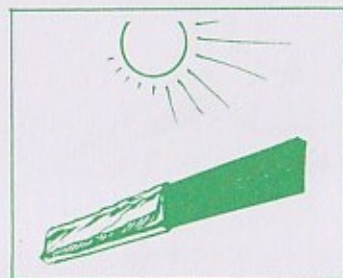


Demonstrate Heating of Absorbed Sunlight vs. Reflected Sunlight

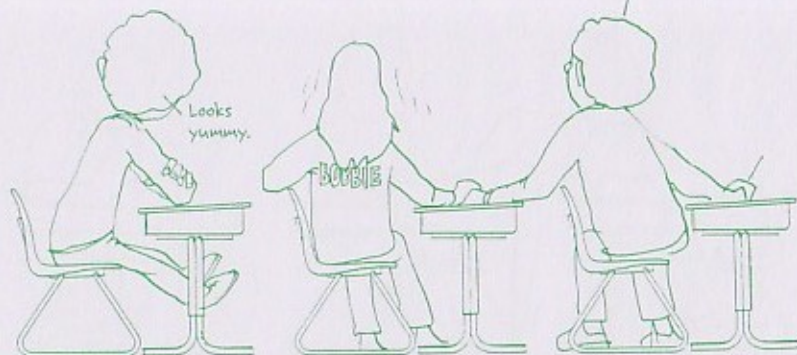
Why in the world would you want to heat any kind of sunlight?



Paint a small piece of wood (a ruler is fine) with flat black paint. Wrap about half of it with aluminum foil. Place it in the sun for an hour or so. Have students feel the temperature difference between the *absorbing* surface and the *reflecting* surface.

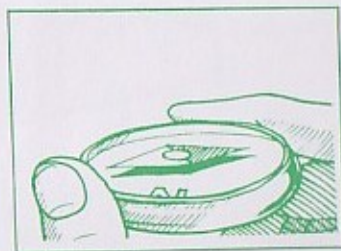


Have your father write an essay on how his favorite ruler looked before you took it, and how it looks now.

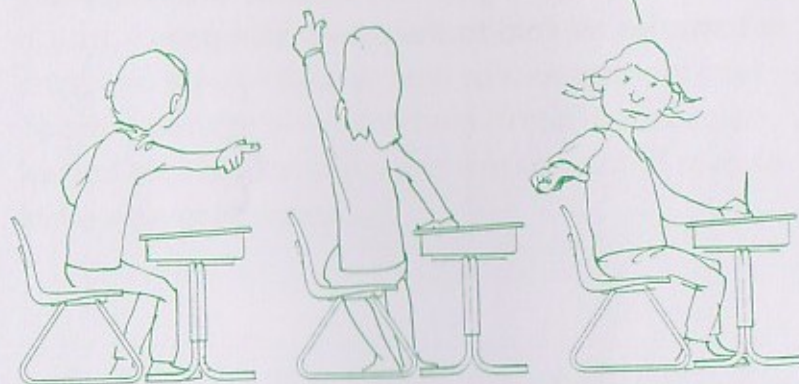


Locating South

Using a simple compass, point various students in different directions and ask each one to locate north and south.

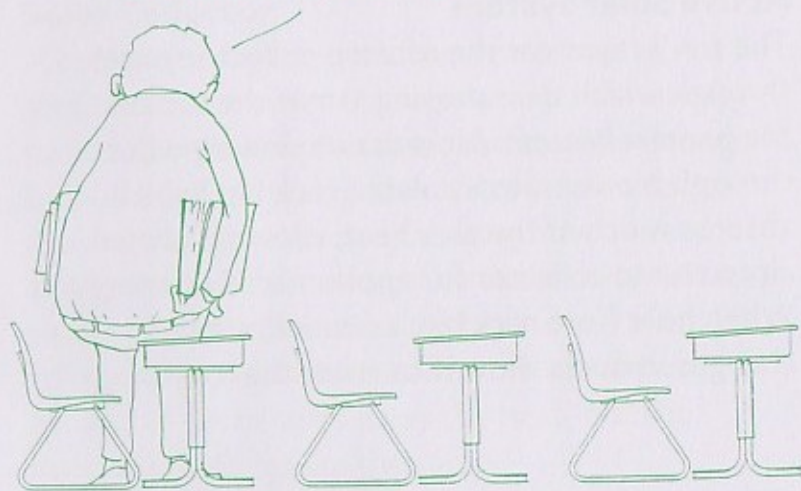


Why do I need a compass to point kids in different directions?

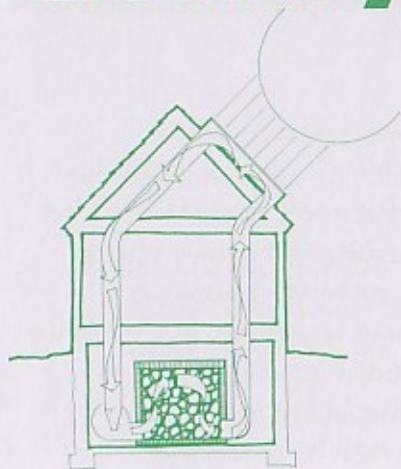


Mark their findings on the floor with chalk, and see who comes closest to your pre-determined (but hidden) mark.

Now, how about some passive solar experiments? I want to knock a wall flat or put an oven on the roof, something like that. Got any experiments along those lines, Mrs. Robinson, or must I now be satisfied with having learned everything there is to know about solar energy? You're pointing to the door. Is that a message? OK, OK, I get it. Goodbye. See you later, Mrs. R.

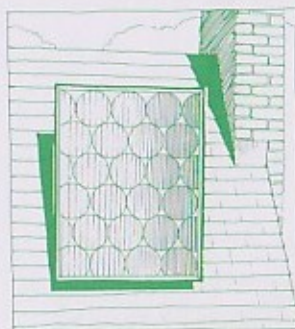


Glossary



Active Solar System

The sun's rays heat the rooftop collector panel through which air is moving. Air at the top of the panel is hottest. Air is drawn down via ducts through blower into insulated rock bin, which absorbs much of the air's heat, allowing cooler air to rise to collector for another load of energy. When heat from rock bin is needed, simple changes in ducts allow it to enter the rooms.



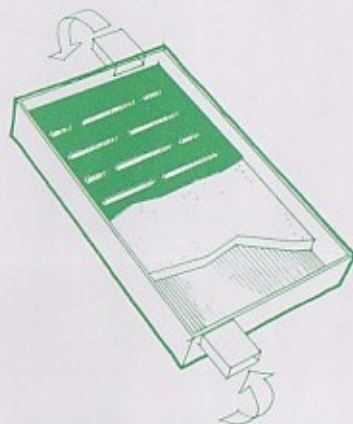
Solar Cells (PVs)

Photovoltaic panel on roof converts sunlight directly to electricity. Power is either used, stored in batteries, or sold to the power company.



Passive Solar System

Shaded area shows Trombe wall behind insulating glass. A wall of concrete, brick, stone, or even water drums, painted black, absorbs solar heat on sunny days, and slowly radiates heat to rooms hours later. Top and bottom vents can help circulation of solar-heated air. Flaps on vents prevent unwanted reverse airflow on cold nights.



Solar Collector

A rooftop collector, usually made of metal, has a glass or plastic cover through which solar energy passes. On striking the black surface, the energy is converted to heat, which is drawn away by the moving air. Note arrows showing how air enters and leaves, baffles to improve the transfer of heat to the air, and the insulation behind the black collector surface. Many collectors use water instead of air to carry away the heat, but the general principles are the same.

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TILLY SPETGANG is a newspaper journalist, author, magazine writer, teacher at the Writer's Workshop for Rutgers University, and a former radio talk-show host. A lifelong conservationist, she was the force behind the worldwide effort to put bricks in toilet tanks to reduce the amount of water used when flushing, which led to the retooling of tanks from 8 to 1.6 gallons of water per use.

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